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United States  
Department of  
Agriculture

Forest Service

Tongass  
National Forest

R10 - MB-353

December 1997



# Canal Hoya Timber Sale

Draft  
Environmental Impact Statement

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United States  
Department  
of Agriculture

Forest  
Service

Region 10  
Tongass National Forest

Stikine Area  
P.O. Box 309  
Petersburg, Alaska 99833  
(907-772-3841)

File Code: 1950

Date: January 6, 1998

Dear Reviewer:

Here is a copy of the Draft Environmental Impact Statement (EIS) for the Canal-Hoya Timber Sale in the Stikine Area of the Tongass National Forest. This document describes one no-action alternative and four action alternatives ranging from 12 to 17 million board feet of timber harvest. The preferred alternative is alternative 3, which includes 15 million board feet of timber, to be harvested from 700 acres in 21 units. Harvest methods include clearcuts with reserve trees, patch cuts, and partial cuts with diameter limits. Road construction would include 9 miles of specified and temporary road.

The comment period on the Draft EIS will be 45 days from the date on which notice of availability of the Draft EIS is published in the Federal Register, anticipated to be January 16, 1998. The deadline for comments is anticipated to be March 2, 1998. The Final EIS is expected to be completed in May 1998.

Federal court decisions have established that reviewers of a Draft EIS must structure their participation so that it is meaningful and alerts an agency to the reviewer's position and contentions. Environmental objections that could have been raised at the Draft stage may be waived if not raised until after completion of the Final EIS. This is so substantive comments and objections are made available to the Forest Service at a time when it can meaningfully consider them and respond to them in the Final EIS.

I am the responsible official for this project. As a result, I will be deciding whether or not timber harvest will occur in the Canal Hoya study area at this time. Furthermore, if timber harvest does occur, I will be deciding where and how it occurs, where road and log transfer facilities are developed, and what mitigation measures are required.

Please send written comments to Scott Posner, Team Leader, USDA Forest Service, P.O. Box 51, Wrangell, AK 99929, or call (907) 874-2323 for additional information or if you would like additional copies of the Draft EIS.

Sincerely,

PATRICIA A. GRANTHAM  
Acting Forest Supervisor





Draft Environmental Impact Statement

## Canal Hoya Timber Sale

United States Department of Agriculture  
Forest Service – Alaska Region

---

Lead Agency:USDA Forest Service  
Tongass National Forest  
Stikine Area

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Reviewer Comments Must Be Received By:  
March 2, 1998

### **Abstract:**

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This Draft Environmental Impact Statement describes the effects of four "action" alternatives and one "no action" alternative for harvesting timber in the Canal Hoya Project Area.



# Summary



Summary



# Summary

This Environmental Impact Statement (EIS) was prepared by the Stikine Area of the Tongass National Forest to document the effects of and alternatives to a proposed timber sale in two Value Comparison Units (VCU). VCU 5210 (Canal Creek) and VCU 5200 (Hoya Creek) are along the south shore of the Bradfield Canal. In this document we describe the "proposed action" and three alternative strategies for harvesting timber, building roads and building log transfer facilities in the Canal Hoya Project Area. A "no action" alternative is also described.

**Chapter 1** provides the purpose and need for the project we are proposing, the public issues surrounding the proposed action, and other important information. The purpose and need for the proposed action is to respond to the goals and objectives identified by the Revised Forest Plan for the timber resource while moving the Canal Hoya Project Area towards the desired future condition for all resources. The public comments we received during scoping showed that there were five main issues that people were most concerned about:

Timber Supply and Economics,  
Scenic and Tourism Values,  
Anan Bears,  
Wildlife Habitat and Species Conservation,  
Freshwater and Marine Resources.

**Chapter 2** discusses the alternatives we designed, as a result of our analysis and the public comment we received.

- The Proposed Action Alternative 1 emphasizes timber volume and harvest economics in the **Hoya VCU** and balances bear habitat security, visual concerns, soil and water quality, and timber production in the **Canal VCU**.
- Alternative 2 responds primarily to public concerns about timber harvest and economics, and proposes the highest level of harvest and road construction.
- Alternative 3 emphasizes bear habitat security, soil and water quality, and visual concerns in the **Canal VCU**, and emphasizes timber volume and harvest economics in the **Hoya VCU**. Under this alternative, there would be no roads constructed in the Canal VCU, which is nearest to the Anan Wildlife Viewing Area.
- Alternative 4 emphasizes wildlife habitat and security, visual objectives, soils and water quality throughout the Project Area. This alternative proposes the least amount of road of all the action alternatives, and partial harvest prescriptions would be emphasized.
- The No Action Alternative (Alternative 5) proposes no change to the existing environment in the Canal Hoya Project Area.

We selected Alternative 3 as our preferred alternative, because it best met the purpose and need of providing timber, while maintaining desired conditions for Anan bears and other resources.

**Chapter 3**, Affected Environment and Environmental Effects, describes the Project Area and predicts changes likely to occur with implementation of the alternatives. These changes include both direct and indirect impacts of the five alternatives for each resource issue. Potential cumulative impacts of reasonably foreseeable or similar actions are also disclosed.

There are extra maps at the end of Appendix A, so you can remove them and refer to them as you review this document.

Table S-1

## Alternative Comparison Table

|  | Alt 1       | Alt 2       | Alt 3      | Alt 4      | Alt 5<br>No Action |
|--|-------------|-------------|------------|------------|--------------------|
| <b>Total Acres Classified as Suitable for Harvest</b>                      | 3670        | 3670        | 3670       | 3670       | 3670               |
| <b>Proposed Treatment Acres</b>  | <b>780</b>  | <b>800</b>  | <b>700</b> | <b>610</b> |                    |
| Canal Creek VCU  | 230         | 290         | 140        | 120        | 0                  |
| Hoya Creek VCU   | 550         | 510         | 560        | 489        | 0                  |
| <b>Harvest by Volume Strata (acres)</b>                                    |             |             |            |            |                    |
| Low Volume (2120 acres existing)   | 85          | 40          | 60         | 110        | 0                  |
| Medium Volume (5800 acres existing)  | 415         | 395         | 340        | 290        | 0                  |
| High Volume (4500 acres existing)  | 280         | 365         | 300        | 210        | 0                  |
| <b>% of Suitable Treated</b>   | <b>21%</b>  | <b>22%</b>  | <b>19%</b> | <b>17%</b> | <b>0</b>           |
| <b>Total Volume (MMBF)</b>   | <b>16</b>   | <b>17</b>   | <b>15</b>  | <b>12</b>  | <b>0</b>           |
| Cable Yarded   | 8.2         | 11.5        | 7.0        | 1.3        | 0                  |
| Helicopter Yarded  | 7.3         | 4.9         | 7.5        | 10.8       | 0                  |
| ROW Volume   | .5          | .7          | .4         | .2         | 0                  |
| <b>Net Stumpage (\$/MBF)</b>   |             |             |            |            |                    |
| Hoya LTF Option  | -\$133      | -\$137      | -\$124     | -\$107     | 0                  |
| Capsize Cove LTF Option  | -\$139      | -\$142      | -\$130     | -\$114     | 0                  |
| <b>Number of Direct Jobs Produced During Life of Sale</b>                  | <b>69</b>   | <b>74</b>   | <b>65</b>  | <b>53</b>  | <b>0</b>           |
| <b>Specified Road (miles): Hoya LTF Option</b>                             | <b>8.5</b>  | <b>11.3</b> | <b>7.3</b> | <b>2.6</b> | <b>0</b>           |
| Capsize Cove LTF Option  | 8.7         | 11.5        | 7.4        | 2.8        | 0                  |
| <b>Temporary Road</b>  | <b>1.6</b>  | <b>2.8</b>  | <b>1.6</b> | <b>0</b>   | <b>0</b>           |
| <b>Total Road Miles: Hoya LTF Option</b>                                   | <b>10.1</b> | <b>14.1</b> | <b>8.8</b> | <b>2.6</b> | <b>0</b>           |
| Capsize Cove LTF Option  | 10.3        | 14.2        | 9.0        | 2.8        | 0                  |
| <b>Log Transfer Sites</b>  | <b>2</b>    | <b>2</b>    | <b>1</b>   | <b>1</b>   | <b>0</b>           |
| <b>Visibility</b> From Blake Island  |             | most        |            | least      |                    |
| From Mouth of Canal Creek  |             | most        |            | least      |                    |
| From Mouth of Hoya Creek   | most        |             |            | least      |                    |
| <b>Harvest by Visual Management Class (acres)</b>                          |             |             |            |            |                    |
| Visual Management Class 2  | 300         | 350         | 240        | 190        | 0                  |
| Visual Management Class 3  | 370         | 300         | 310        | 350        | 0                  |
| Visual Management Class 4  | 110         | 150         | 150        | 70         | 0                  |
| <b>Duration of Operations (years)</b>                                      | <b>3-5</b>  | <b>3-5</b>  | <b>3-4</b> | <b>2-3</b> | <b>0</b>           |
| <b>Brown Bear Denning Habitat Harvested (1985 acres existing)</b>          | <b>73</b>   | <b>134</b>  | <b>89</b>  | <b>80</b>  | <b>0</b>           |
| <b>% of Anan Bear Locations Within 1 Mile of Proposed Roads</b>            | <b>12%</b>  | <b>13%</b>  | <b>6%</b>  | <b>2%</b>  | <b>0</b>           |
| <b>% of Highly Suitable Habitat in Project Area Reduced in Quality for</b> |             |             |            |            |                    |
| Black Bear   | 56          | 60          | 40         | 26         | 0                  |
| Brown Bear   | 4           | 3           | 3          | 2          | 0                  |
| Mountain Goat  | 3           | 55          | 54         | 3          | 0                  |
| Deer (Medium Suitable Habitat Reduced in Quality)                          | 18          | 16          | 15         | 6          | 0                  |
| Marten   | 9           | 10          | 8          | 6          | 0                  |
| Goshawk  | 5           | 6           | 6          | 5          | 0                  |
| <b>Project Area Habitat Capability as a % of Current Condition</b>         |             |             |            |            |                    |
| Black Bear   | 84          | 81          | 87         | 91         | 100                |
| Brown Bear   | 92          | 90          | 94         | 96         | 100                |
| Mountain Goat  | 91          | 87          | 89         | 95         | 100                |
| Deer   | 92          | 92          | 94         | 95         | 100                |
| Marten   | 95          | 95          | 95         | 96         | 100                |
| <b>Drainage Structures on Fish Streams</b>                                 | <b>14</b>   | <b>15</b>   | <b>12</b>  | <b>2</b>   | <b>0</b>           |
| <b>Harvest in Watersheds with the Most Fish Habitat (acres)</b>            |             |             |            |            |                    |
| Canal (4.1 miles of fish stream)   | 60          | 65          | 0          | 0          | 0                  |
| Hoya (18.9 miles of fish stream)   | 140         | 135         | 135        | 5          | 0                  |
| Survey (5.8 miles of fish stream)  | 275         | 305         | 325        | 385        | 0                  |
| <b>% Watershed Harvest in Most Sensitive Watersheds</b>                    |             |             |            |            |                    |
| Hoya   | 1%          | 1%          | 1%         | 0          | 0                  |
| Survey   | 7%          | 8%          | 8%         | 10%        | 0                  |
| <b>Road Miles in Watersheds with the Most Fish Habitat</b>                 |             |             |            |            |                    |
| Canal  | 0           | 1.0         | 0          | 0          | 0                  |
| Hoya   | 2.2         | 2.0         | 2.0        | 0          | 0                  |
| Survey   | 4.3         | 5.2         | 5.2        | 2.1        | 0                  |
| <b>Volume Through LTFs (MMBF)</b>  | <b>15</b>   | <b>17</b>   | <b>12</b>  | <b>8</b>   | <b>0</b>           |
| <b>Volume to Barge (MMBF)</b>  | <b>1</b>    | <b>0</b>    | <b>3</b>   | <b>4</b>   | <b>0</b>           |



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# **Chapter 1**

## **Purpose and Need**



Chapter 1

Chapter 2

# Chapter 1

## Purpose and Need

### Introduction: This Document and You

Thank you for your interest in the proposed Canal Hoya Timber Sale. This Draft Environmental Impact Statement (DEIS) was prepared by the Stikine Area of the Tongass National Forest to document our efforts to (1) make decisions about a possible timber sale within the Canal Hoya Project Area based upon laws and other direction and upon public needs and concerns, and (2) to continue to keep you informed and involved by providing you another opportunity to comment. After public review of this document, a Final Environmental Impact Statement will be published and the Forest Supervisor of the Stikine Area, Tongass National Forest, will make a final decision, which will be documented in a Record of Decision.

This document outlines the effects of and alternatives to a proposed timber sale in the Canal Creek and Hoya Creek watersheds, along the Bradfield Canal, known as the Canal Hoya Project Area. In this document we describe the "proposed action" and three alternative strategies for harvesting timber. These strategies also include building and maintaining roads and log transfer facilities in the Canal Hoya Project Area. A "no action" alternative is described. We have disclosed the environmental effects and resource outputs that we expect from the Proposed Action and each of the alternatives. You have the opportunity to comment on this document within 45 days from the date of publication. The more specific you are about your suggestions and concerns, the better we will be able to respond. Possible areas for comment include:

1. What you do or don't like about the alternatives or specific aspects (units, roads etc.) of certain alternatives.
2. Your thoughts concerning mitigation measures included in all alternatives.
3. Areas we can better explain or disclose possible environmental concerns.

If you do choose to comment, we will respond to you by letter. Both your letter and our response will be published within the Final Environmental Impact Statement along with any changes in the project and document.

This EIS is prepared according to the format established by Council on Environmental Quality (CEQ) regulations (40 CFR 1500-1508). In general, the objective is to furnish enough site-specific information to demonstrate a reasoned consideration of the environmental impacts of the alternatives and how these impacts can be mitigated.

The planning record is available at the Wrangell Ranger District office in Wrangell, AK. Other reference documents such as the Forest Plan (USDA Forest Service 1997a), the Tongass Timber Reform Act, the Resources Planning Act, and the Alaska Regional Guide EIS, are available at public libraries around the region as well as at the Supervisor's Office in Petersburg.

# 1 Purpose and Need

## Document Organization

**Chapter 1** provides the purpose and need for the project we are proposing, the public issues surrounding the action, and other introductory information. It also discusses how the Canal Hoya Timber Sale relates to the Forest Plan and to other related NEPA actions, the key issues driving the EIS analysis, and the authorities guiding the EIS process.

**Chapter 2** describes and compares the alternatives for accomplishing the proposed action and no-action alternatives. It includes summary information on their environmental impacts, implementation and mitigation.

**Chapter 3** describes the environment and predicts changes likely to occur with implementation of the alternatives. These changes include both direct and indirect impacts of the alternatives on the human and natural environment for each resource issue. Potential cumulative impacts of reasonably foreseeable or similar actions are also disclosed.

**Chapter 4** contains the list of preparers, distribution list, glossary, index, and cited literature. The glossary will be especially useful to reviewers unfamiliar with technical terms or some of the more relevant laws regarding environmental analyses.

Finally, supportive information on units, roads, monitoring, log transfer facilities, and how this sale fits in with the Tongass-wide timber sale plans is included in the appendices. Additional documentation may be found in the project planning record located at the Wrangell Ranger District office in Wrangell, AK.

## Project Area

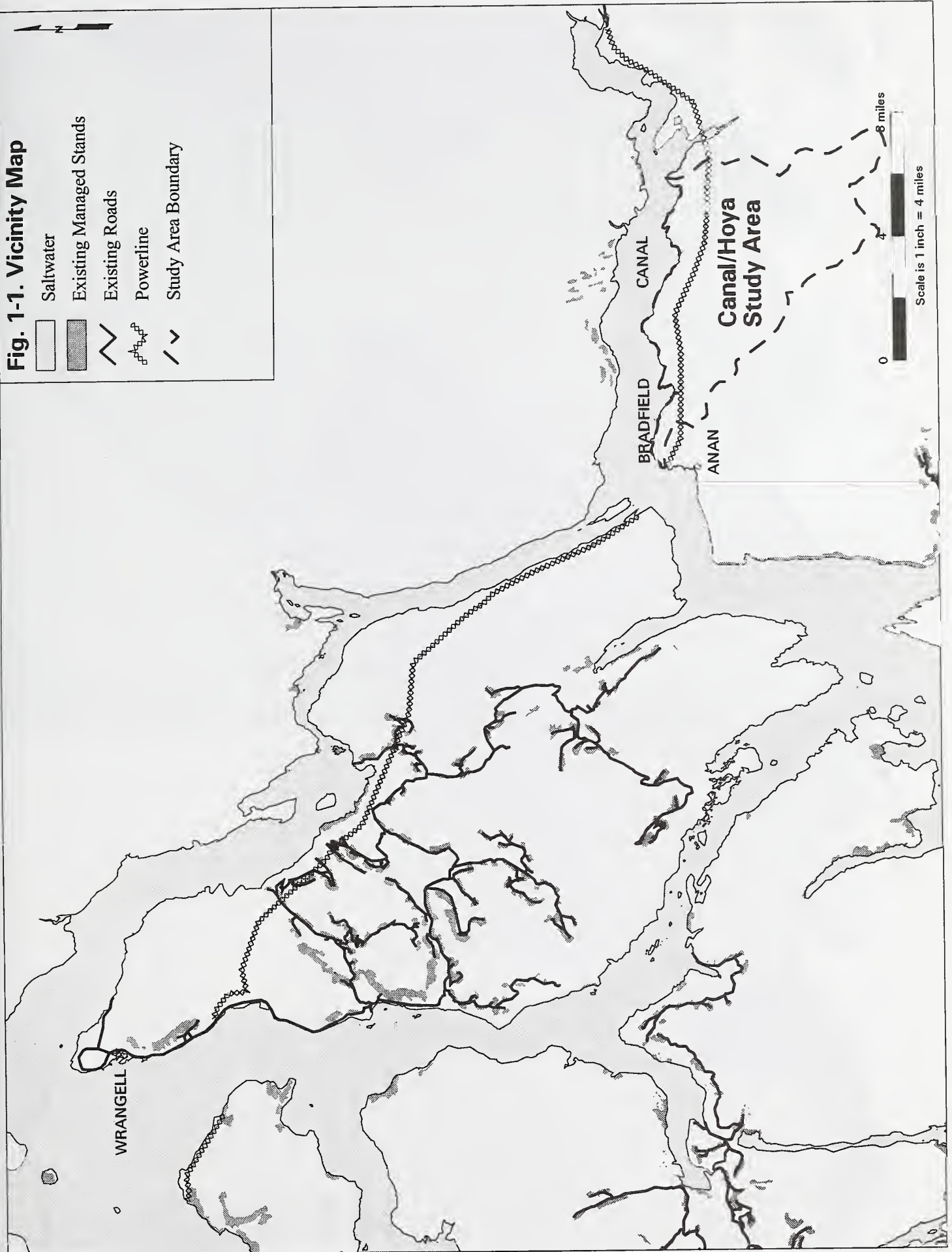
The Canal Hoya Timber Sale Project Area is located in Southeast Alaska on the south shore of the Bradfield Canal, 30 miles southeast of the town of Wrangell, Alaska (see Figure 1-1). The 26,000 acre Project Area includes the Canal Creek and Hoya Creek watersheds. These watersheds are designated as Value Comparison Units 5210 and 5200, respectively. There are no roads or developed facilities in the Project Area at this time.

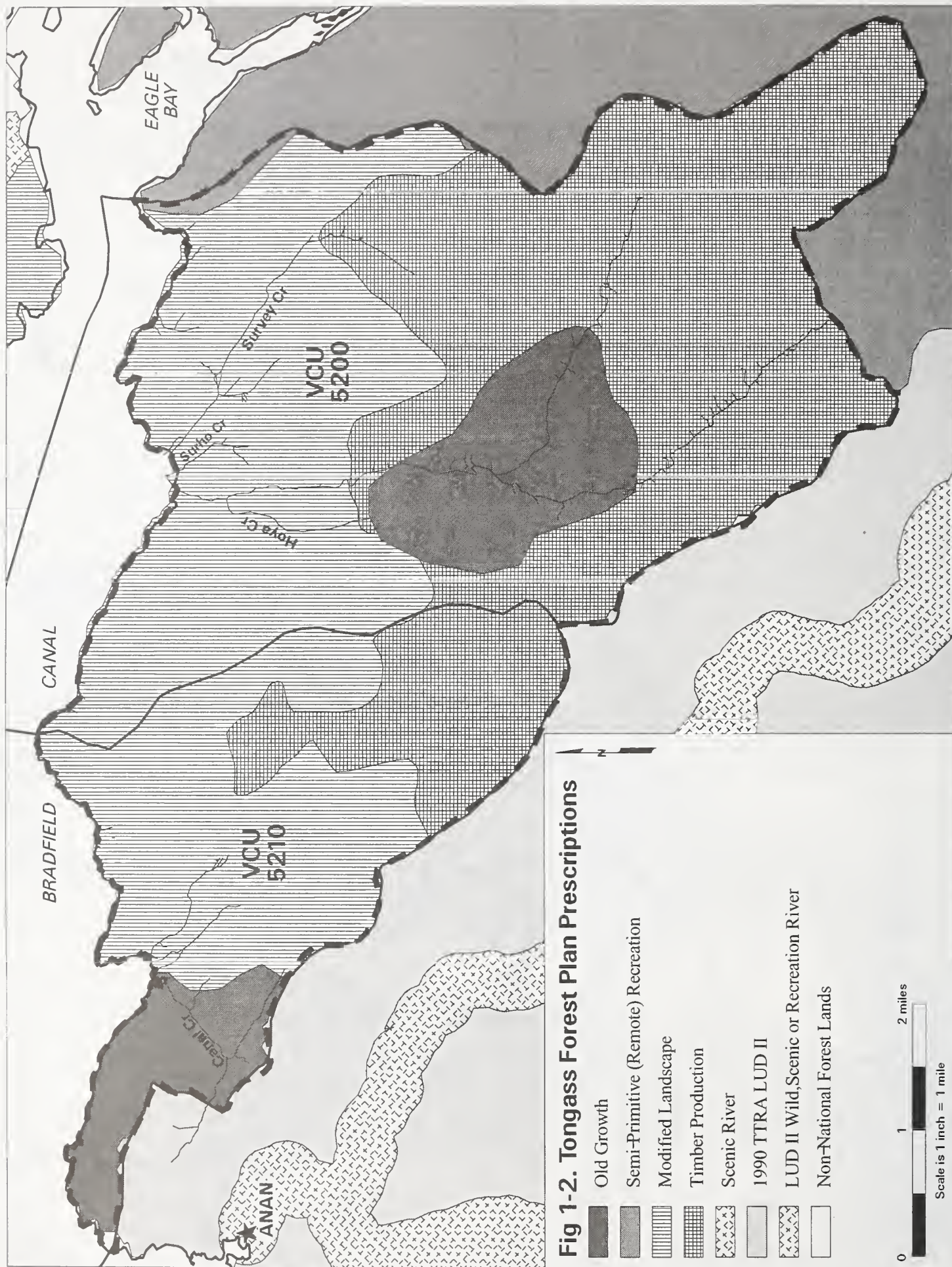
The project area is bordered to the west by a congressionally designated Land Use Designation II watershed and to the east by Semi-Remote Recreation Management Prescription area, both of which do not allow programmed timber harvest. The Anan Wildlife Viewing Area, known especially for bear viewing opportunities, is about one mile west of the Project Area boundary (Figure 1-2). North of the Project Area, across the Bradfield Canal, is the Campbell Timber Sale, where partial harvest of 476 acres was completed in 1995 (Figure 1-1).

## Proposed Action

At the start of the planning process we defined a "proposed action". This serves as a starting point for the planning process and lets the public and other agencies know more about the project we are considering so you can comment. We then develop other alternatives to the proposed action in response to environmental issues, public concerns and comments from other agencies. The "proposed action" could become, but does not have to be, our "preferred alternative".









The proposed action for this project would harvest about 16 MMBF of sawlog and utility timber on approximately 780 acres in VCU 5210 (Canal Creek) and VCU 5200 (Hoya Creek). A variety of harvest methods would be used, which would leave various densities of trees in harvested areas. Two log transfer sites would be constructed - one near Canal Creek and another west of Hoya Creek. The log transfer sites could utilize floating LTF structures, which are available on the Stikine Area. Both helicopter and cable yarding systems would be used. Approximately 10 miles of "specified" road and temporary roads would need to be constructed in the Canal and Hoya VCUs.

The proposed action, and all alternatives, include a non-significant amendment to the Forest Plan to increase the size of the old growth reserve in VCU 5200 (Hoya) by adding the isolated area to the south, which is currently designated Timber Production management prescription, but cannot be accessed for timber management. This will more accurately portray what will occur on the ground. The change will increase the size of the Hoya old growth reserve by approximately 7800 acres, of which 196 acres were classified in Forest Plan calculations as isolated, but suitable for timber production. See page 2-3 and 3-61 for more detail on the old growth reserves.

## Decision to be Made

The Record of Decision for the Forest Plan established that timber harvest is appropriate in the Canal Hoya study area. The Stikine Area Forest Supervisor will decide: 1) if, where and how much timber harvest should occur in the Canal Hoya area at this time, and if so, 2) where road and log transfer facility development should occur to facilitate harvest and, 3) what mitigation measures and monitoring would be implemented.

## Purpose and Need

The purpose and need for the proposed action is to respond to the goals and objectives identified by the Forest Plan for the timber resource while moving the Canal Hoya Project Area towards the desired future condition for all resources. The Forest Plan identified the following goals and objectives:

- 1) Manage the timber resource for production of saw timber and other wood products from suitable timber lands made available for timber harvest, on an even-flow, long-term sustained yield basis and in an economically efficient manner (USDA Forest Service 1997a, page 2-4).
- 2) Seek to provide a timber supply sufficient to meet the annual market demand for Tongass National Forest timber, and the demand for the planning cycle (page 2-4) and
- 3) Maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs (page 3-144).
- 4) Produce desired resource values, products, and conditions in ways that also sustain the diversity and productivity of ecosystems (page 2-1).

The Canal Hoya Timber Sale is expected to provide between 10 to 17 million board feet to the timber industry. The range of alternatives considered in this Environmental Impact Statement was determined during our analysis and reflects issues raised during scoping.

# 1 Purpose and Need

## Overall Direction for the Project

### Overall Management Direction for the Project Area

Areas identified as Modified Landscape and Timber Production Management Prescription lie within the Project Area. Goals in the Forest Plan for management of those lands emphasize timber production and scenic quality:

Maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs. Seek to provide a supply of timber from the Tongass National Forest which meets annual and planning-cycle market demand, consistent with the standards and guidelines of these Management Prescriptions.

Manage these lands for sustained long-term timber yields (both Management Prescriptions) and a mix of resource activities while minimizing the visibility of developments in the foreground distance zone (Modified Landscape Management Prescription, Figure 1-2)

Recognize the scenic values of suitable timber lands viewed from identified popular roads, trails, marine travel routes, recreation sites, bays and anchorages, and modify timber harvest practices accordingly (Modified Landscape).

## Desired Future Condition

The Forest Plan describes the following desired condition for the **Timber Production Management Prescription** (13,700 acres of the Project Area):

"Suitable timber lands are managed for the production of sawtimber and other wood products on an even-flow, long-term sustained yield basis; the timber produced contributes to a Forest-wide sustained yield. An extensive road system provides access for timber management activities, recreation uses, hunting and fishing, and other public and administrative uses; some roads may be closed, either seasonally or year-long, to address resource concerns. Management activities will generally dominate most seen areas. Tree stands are healthy and in a balanced mix of age classes from young stands to trees of harvestable age, usually in 40 to 100 acre stands. Recreation opportunities associated with roaded settings, from Semi-primitive to Roaded Modified are available. A variety of wildlife habitats, predominantly in the early and middle successional stages are present."

The Revised Forest Plan describes the following desired condition for the **Modified Landscape Management Prescription** (11,900 acres of the Project Area - including most of the land proposed for harvest activities, Figure 1-2):

"In areas managed under the Modified Landscape Management Prescription, forest visitors, recreationists, and others using popular travel routes and use areas will view a somewhat modified landscape. Management activities in the visual foreground will be subordinate to the characteristic landscape, but may dominate the landscape in the middle and backgrounds. Within the foreground, timber harvest units are typically small and affect only a small percentage of the seen area at any one point in time. Roads, facilities and other structures are also subordinate to the foreground landscape. Recreation opportunities associated with natural-appearing to modified settings are available. A variety of successional stages provide a range of wildlife habitat conditions. A yield of timber is produced which contributes to Forest-wide sustained yield."



*Special circumstances in the Project Area guide our desired conditions.*

The desired conditions described by the Forest Plan provide a basis for management of the Canal Hoya Project Area. Management activities will also be influenced by Forest Plan standards and guidelines and circumstances particular to the Project Area. Those circumstances include the adjacent LUD II (roadless) areas, the nearby Anan wildlife viewing area, and the economic needs of commercial fishermen and outfitters and guides. The following desired conditions will guide our management of the Canal Hoya Project Area in a manner consistent with the Forest Plan and the special circumstances of the area:

**Soil productivity will be maintained, while using the resources it produces.**

- Harvest timber on lands that are not adversely affected by the management activities. For example: harvest timber where the slopes are not overly steep unless site-specific prescriptions indicate there is not a high risk of management-induced slope failure. Manage timber yarding so the side-slopes of v-notch drainages will not be disturbed.
- Locate, construct and maintain roads in ways that minimize environmental disturbance. Avoid locating roads in areas with unstable soils to prevent an increase in the potential for mass soil movement.

**Aquatic productivity will be maintained or enhanced**

- Maintain fish habitat, stream bank and stream channel processes, large woody debris supply, water quality, and fish passage through crossing structures.
- Maintain balance between streamflow and sediment supplies to assure long term channel stability. Maintain streamflow regimes that support critical aquatic life stages.
- Protect State designated beneficial uses ("growth and propagation of fish, shellfish, other aquatic life and wildlife").

**Biologically important habitats will continue to be represented in the Project Area, so a full spectrum of wildlife habitat needs is accounted for and landscape biodiversity is maintained.**

- Follow Forest Plan direction to maintain the long-term viability of wildlife populations by managing the size and shape of forest blocks, travel corridors between forest blocks and migration pathways.
- Maintain remnant patches of "old growth" in or adjacent to harvest areas to provide a seed source to eventually recolonize areas where forbs and shrubs have been shaded out by dense second growth.
- Maintain subsistence resources by managing habitats and landscapes for game populations and by controlling access through minimizing road building and through road management.
- Maintain the population of bears that frequent Anan by managing motorized access. Maintain old growth habitat in denning site areas used by Anan bears.
- Strive for a Visual Quality Objective (VQO) of Partial Retention in the Canal VCU.
- Manage timber harvest operations (including timing) to minimize impacts on the tourism business connected with Anan.

*The existing condition of the Project Area is described in Chapter 3 of this EIS, in the "Affected Environment" of each resource section.*

**Visual quality will be maintained along the travel route from Wrangell to Anan Wildlife Observatory.**

- Strive for a Visual Quality Objective (VQO) of Partial Retention in the Canal VCU.

# 1 Purpose and Need

## Public Involvement

When a timber sale project begins, we designate a group of professionals with a variety of educational backgrounds to a team known as an "interdisciplinary team" or IDT. The Canal Hoya IDT listened to public comment and worked with you and the various State and Federal agencies in an effort to plan the best possible project. The team conducted the planning process and wrote this document to inform you and the Forest Supervisor of the environmental consequences of the proposed action and alternatives.

### Public Scoping

"Public Scoping" is the term we use to describe the process of identifying the significant issues for a project by contacting interested individuals and agencies to determine their concerns. The following is a summary of the letters, contacts, and meetings that took place during the planning of this project:

- April 1996 - Preliminary Scoping Letter to identify issues
- December 1996 - Notice of Intent published in the Federal Register
- December 1996 - Scoping Letter sent to clarify issues and identify alternatives
- Winter/Spring 1997 - Newspaper articles and notes describing the project and opportunities for comment.
- October 1997 - Revised Notice of Intent published in the Federal Register. Field data indicates that the volume per acre in the study area is lower than the estimate used to establish the volume for the Purpose and Need for this project in the original Notice of Intent. The revised Notice of Intent incorporates the updated information to provide for a range of volumes in the Purpose and Need, which also allows us to better address the issues and desired conditions related to this project.
- Meetings with individuals, agencies, and organizations including: Alaska Department of Fish and Game (ADFG), Alaska Department of Environmental Conservation (ADEC), Alaska Division of Governmental Coordination (DGC), Environmental Protection Agency (EPA), National Marine Fisheries Service (NMFS), United States Fish and Wildlife Service (USFWS), Wrangell Resources Council and Stikine Jetboat Association.

### Other Agency Involvement - Permits, Licenses, and Certifications

Several other agencies reviewed this project to provide their professional point of view on topics in which they have expertise. In some cases, reviews are necessary because another agency has authority to issue permits for a specific activity we propose. Below, we describe our relationship to other agencies in the planning of this project.

**US Army Corps of Engineers** - The Corps is responsible for approving proposals to dredge or fill materials in the coastal waters of the United States under Section 404 of the clean water act. In this project, we seek a permit from the Corps for Log Transfer Facilities. The Corps also has administrative authority over activities associated with wetlands. Any road construction in wetlands is of interest to the Corps and we must consider and reduce our effects on those areas. All roads proposed for this project are for the purpose of managing the timber resource.

**Environmental Protection Agency** - The EPA provides a general review in accordance with their responsibilities under the National Environmental Policy Act, Section 309 of the Clean Air Act, and Section 402 of the Clean Water Act. They also administer permits associated with the Log Transfer Facilities under the National Pollution Discharge Elimination System.

**National Marine Fisheries Service** - NMFS has authority for threatened or endangered marine life and we consulted with them on possible effects on those species.

**US Fish and Wildlife Service** - USFWS administers the Endangered Species Act. We consult with the USFWS to determine if we are affecting Threatened or Endangered species. We also discuss effects on other wildlife species with the USFWS, since they have expertise in many areas and are interested in managing for wildlife in ways that will prevent the need for listing species as Threatened or Endangered in the future. The USFWS also conducted dive surveys of potential log transfer facilities and offered recommendations on suitable sites.

**State of Alaska** - Five departments in the State of Alaska are asked to participate in the planning of this project. They give general comments and suggestions as well as specific reviews, such as :

- 1) Division of Governmental Coordination - Provides overall coordination for the State's comments and administers Alaska Coastal Management Program (ACMP), which requires the Forest Service to design activities compatible with approved State management guidelines,
- 2) Department of Environmental Conservation - Participates in cooperative water quality management through Section 319 of the Clean Water Act and a Memorandum of Agreement with the Forest Service. ADEC also issues a certificate of compliance with Alaska Water Quality Standards under Section 401 of the Clean Water Act,
- 3) Department of Fish and Game - Involved in the Coastal Zone Consistency review and are especially interested in fish, water, wildlife and subsistence issues,
- 4) Department of Natural Resources - Tideland permit and lease or easement necessary for the log transfer site,
- 5) State Historic Preservation Office - Compliance with Section 106 of the National Historic Preservation Act, a process to determine the effects of alternatives on heritage resources.

## Category 3 Timber Sale Review

The Forest Service met with representatives from the interagency implementation team on October 10, 1997 (National Marine Fisheries Service, Environmental Protection Agency, U.S. Fish and Wildlife Service, Alaska Division of Governmental Coordination, Department of Fish and Game, and Department of Environmental Conservation) to review the extent to which the new wildlife standards and guidelines added in the 1997 Forest Plan Record of Decision (USDA 1997b, page 41) should be incorporated into the Canal Hoya Timber Sale Project. The new wildlife standards and guidelines address landscape connectivity, endemic terrestrial mammals, northern goshawk, and American marten. The intent of these new standards and guidelines is to avoid some possible long-term cumulative effect. The meetings further developed the communication with the other resource management agencies regarding the timber sale planning process.

## Field Studies

Field studies were conducted in 1994, 1996 and 1997 to collect specific information relative to issues and to verify resource information contained in the Tongass National Forest geographic information system (GIS). Examples of resource information in GIS include sensitive stream zones, important wildlife habitat, timber and soil inventories, and location of proposed harvest units. Field studies used unit and road design cards for all action alternatives to document the location of proposed harvest units and roads. Resource specialists listed specific concerns on the cards and recommended how those concerns should be addressed or mitigated (Appendix A and B).

Information from field studies and GIS was then used to address the issues and analyze the environmental effects of each alternative. The entire analysis was used by the Forest Service to select a preferred alternative for publication in the Draft EIS.



# 1 Purpose and Need

Inventories, resource specialist reports, and GIS information are part of the Canal Hoya planning record. Also included in the planning record are results of public scoping and the unit and road design cards. The planning record will be available for public inspection at the Wrangell Ranger District in Wrangell, Alaska.

## Issues

### Issues Associated with the Proposed Action

Although there are often many issues associated with the planning of a timber sale, the National Environmental Policy Act directs us to analyze in detail only those issues that are significant. This ensures that we focus our analysis and documentation on the issues that are most important to the specific Project Area. We reviewed planning documents for other projects in the area and listened to comments during the public participation process (see a cross section of these comments in the margin adjacent to each issue). This information was used to identify five key issues, which form the basis for the alternatives:

*"...We need a timber industry; consider Helicopter and SBA sale..."*

*"...We hope you will consider a range of alternatives starting at .5 MMBF..."*

*"...Current timber sale economics make it imperative that the maximum volume be obtained from each entry into these areas. Please examine the possibility of increasing harvest to 60 or 70 MMBF at the least..."*

### Issue 1: Timber Supply and Economics

This project has the potential to affect employment and the economy of local communities, which was brought up as an issue during public scoping. Public comments indicated concern about current changes in the timber industry, particularly regarding the pulp products from this sale and questions about the need for the sale given the recent mill closures. The terrain and quality of timber in the Project Area may make it difficult to design a timber sale that would be advertised above base rates, so the economic viability of a sale is also an issue. The amount of wood harvested, the location of old growth reserves and any infrastructure developed with this entry may affect availability and costs associated with future entries for timber harvest. Roads and log transfer facilities constructed for timber harvest may make future sales more economical, but the access they provide between sales is a concern due to other issues, such as increased vulnerability to hunting of Anan bears.

## Issue #2: Scenic and Tourism Values

*"... I am concerned about the very real negative impacts on the fishery, commercial and sport ..."*

*"... This area, Anan in particular, has become a major tourist area. What will be the impact on tourism? No one likes to see clearcuts ..."*

*"... We believe that visual retention is very important in areas like the Bradfield ..."*

*"I have a deep concern that not enough roads will be built. Extensive roading should be pursued in order to increase the access for recreation ..."*

*"...Remove drainage structures ... so that vehicles will not be able to drive the roads ... Prevent hunters from hiking along the roads..."*

*"... We object specifically to the location of an LTF in the same site where we have established a primitive, low impact use ..."*

People are concerned about how this sale would change scenic conditions, and recreation and tourism potential in the Bradfield Canal area. Although this area is used by some local people for recreation, the larger portion of recreationists affected by this sale would be tourists who are accompanied by guides, whether they are fishing, big game hunting, or sight-seeing (particularly at Anan Wildlife Viewing Area). Different people perceive impacts from a sale in different ways. It is not possible to say that any given change would have a net positive or negative effect on a recreationist in the area. It depends on whom we ask. For example, a recreationist who values the addition of roads to previously inaccessible areas would see proposed road building as a definite advantage over no harvest or helicopter yarding. Conversely, a recreationist who values the appearance of an undisturbed natural setting while boating or fishing may support helicopter yarding or no harvest, and would perceive a roaded entry with visible clearcuts as a negative impact on the recreation experience.

We can break the expected changes into three major groups:

**1) Scenery** - How will the area look to people who are boating past? Will the harvest units dominate the landscape, or will they blend in enough to be barely noticeable to the casual observer?

**2) Post sale road management strategies and recreation potential** - How would the proposed management for the road systems (if any are constructed) affect potential recreational users of the area? What type of recreational activities would be favored by the different alternatives?

**3) Direct effects to recreationists, tourists, and outfitters and guides** - The Bradfield Canal area is heavily traveled in the summer months by local users and outfitter/guides transporting clients to the Anan Wildlife Observatory. Additionally, the Bradfield Canal is used by guides for steelhead fishing and big game hunting. How would the actual road building, logging, and presence of logging camps, barges, and log rafts along the coastline affect these users.

# 1 Purpose and Need

*"Can they close the whole area to hunting of both brown and black bears? The construction of roads will make hunting of these animals much easier ..."*

*"...I want to see a guarantee that you will not try to close bear hunting in the area because of the scarcity of viewable bears at Anan..."*

*"We hope you will work closely with the biologists ... to avoid all denning areas ... strict enforcement of firearm and hunting restrictions ..."*

*"The bears at Anan will benefit from clear cutting at Canal Hoya..."*

*"...Leave corridors so bears are able to travel from hibernating and feeding habitats..."*

*"...I am concerned about the impact on the wildlife dependent on this area ; salmon, bears, eagles, etc., and the impact on their habitat..."*

*"...Goats can be adversely affected not only by high elevation roads, but also high elevation timber harvest..."*

*"...It will probably reduce my fur trapping income. All of the other industrial activity in the Bradfield has..."*

## Issue 3: Anan Bears

This is a recreation issue, since people who visit or make their living guiding visitors to Anan are concerned about the effects of the Canal Hoya Timber Sale on the bears that use Anan. The Anan Wildlife Viewing Area is located 1.5 miles to the west of the Canal Hoya Project Area boundary. Some 2000 - 3000 people visit Anan each year to view wildlife, especially the 30-60 black bears and 12-20 brown bears that catch salmon in Anan Creek. Many of the bears that use Anan also den or forage in the Canal Hoya project area.

While the risk to black bear populations may be minimal, it is unclear how the timber sale would affect the behavior and distribution of individual animals now frequenting Anan and therefore, the recreational opportunities available to visitors. Timber harvest on high-value habitat and increasing access with roads has the potential to impact habituated bears at Anan, which in turn affects recreation opportunities. Habituated bears may be at greater risk if encountered by hunters along new road systems or trails.

The Anan bear issue is also a wildlife issue due to a concern for bear populations in the landscape containing a high-value fish stream (Anan creek). Timber harvest on high value habitat and increasing access with roads may impact the brown bear population in the area over time. Viability of brown bears in the Tongass National Forest has been identified as a concern.

## Issue 4: Wildlife Habitat and Species Conservation

Many wildlife species of concern depend on large tracts of old growth with interior forest conditions. Connections between these tracts of forest are a critical component in maintaining species viability.

Old growth reserves and corridors are included in the Forest Plan as a strategy for maintaining biodiversity and viable wildlife populations. The location and habitat quality of the reserves is an important issue in the design of this timber sale.

The level of interest and concern over certain species on the Tongass leads us to conduct a species-level analysis in addition to the community-based habitat analysis mentioned above. Species to consider are generally classified as Management Indicator Species, threatened, endangered, and sensitive, special concern or harvested wildlife species. There is a concern over the acreage and location of critical beach and estuary habitats. Buffers to protect riparian corridors and beach estuary habitats are specified in the Forest Plan; however, the various alternatives discussed for this project have the potential to affect high- volume low elevation habitats in different ways. Key species considered in the design of the alternatives include: brown and black bear, wolf, deer, goat, marten, and goshawk.

The location, density, and use of roads has an effect on the quality of wildlife habitat for certain species. Roads can act as a dispersal barrier to small mammals and amphibian populations. Roads in Canal and Hoya would provide interior access to game animals that currently are only reached by shore or by accessible lakes. Road access has been identified as an issue for species with viability concerns such as the marten, wolf, and brown bear.



*"... I am concerned about the streams in the area of the proposed sale with their drainages in the Bradfield ..."*

*"...Transfer to and the storage of logs in marine waters can result in significant impacts to marine and estuarine habitats important to many species of fish, aquatic vegetation and wildlife ..."*

*"... Do not log on high risk soils areas ..."*

*"... Undue emphasis should not be placed on alleged hazard soils, Karst and other nondescript ways for timber harvest to be limited..."*

*"... if it must be logged, helicopter logging using alternative cutting could avoid these hazards ..."*

## **Issue 5: Freshwater and Marine Resources**

Freshwater and marine resources that may be affected by harvest, roads, log transfer facilities, and log transport are important to the public and various State and Federal agencies who have responsibility for water quality, wetlands, tidelands and fish and wildlife habitat.

The Project Area contains approximately 30 miles of fish-bearing streams, including 3.5 miles accessible by anadromous fish. Salmon and steelhead access into Project Area streams is limited to the lowest reaches of most of the larger streams by steep gradients and impassable bedrock falls. The upper watersheds contain a few small lakes, but most of these are isolated from resident fish populations: only one is known to contain fish. Commercial, subsistence and recreational fishing values associated with freshwater fish habitat within the Project Area are, therefore, relatively low.

Herring spawn along much of the Project Area shoreline and the Bradfield Canal is an important crab and shrimp fishery. The confluence of several large streams into relatively sheltered bays (particularly at Canal Creek) produces high quality estuaries at the mouths of both Canal and Hoya Creeks. Debris on the ocean floor would affect marine habitats by covering the bottom and possibly eliminating some of the ocean flora. Debris in the water could affect fishing gear, and floating camps, barges and log rafts could reduce access to fishing grounds and anchorages.

The watersheds of the Project Area are dominated by steep mountain slopes and narrow valleys. Snow and debris avalanches appear to be frequent and important disturbance processes in the upper watersheds. Much of the mainstem of Hoya Creek, for example, appears to be heavily influenced by recent deposits of sediment and debris from mass failures. There is a high proportion of steep slopes in the eastern portion of the Project Area. There is concern that management induced landslides would affect streams if roads or harvest units were not properly designed or were situated on steep "high hazard" slopes. There is also concern that stream crossings and sediment from roads would affect streams, especially in steep terrain, where larger road cuts or more extreme water flows may occur.

## **Other Environmental Considerations**

In addition to the "key issues," there are other issues that we must disclose by law, or that were brought up by the public. Although those other issues were considered in our analysis, the effects would not be significant, so we describe them briefly in this document. Those other issues include:

- Forest Soils
- Subsistence
- Heritage Resources
- Air Quality
- Effects on Consumers, Civil Rights and Women
- Minerals
- Karst and Caves

# 1 Purpose and Need

## Legislation and Executive Orders Related to This EIS

Shown below is a brief list of laws pertaining to preparation of EISs on Federal lands. Some of these laws are specific to Alaska, while others pertain to all Federal lands.

- National Historic Preservation Act of 1966 (as amended)
- Wild and Scenic Rivers Act of 1968, amended 1986
- National Environmental Policy Act (NEPA) of 1969 (as amended)
- Clean Air Act of 1970 (as amended)
- Alaska Native Claims Settlement Act (ANCSA) of 1971
- Marine Mammal Protection Act of 1972
- Endangered Species Act (ESA) of 1973 (as amended)
- Forest and Rangeland Renewable Resources Planning Act (RPA) of 1974 (as amended)
- National Forest Management Act (NFMA) of 1976 (as amended)
- Clean Water Act of 1977 (as amended)
- American Indian Religious Freedom Act of 1978
- Alaska Native Interest Lands Conservation Act (ANILCA) of 1980
- Archeological Resource Protection Act of 1980
- Cave Resource Protection Act of 1988
- Tongass Timber Reform Act (TTRA) of 1990
- Executive Order 11988 (floodplains)
- Executive Order 11990 (wetlands)
- Executive Order 11593 (heritage)
- Executive Order 12962 (aquatic systems and recreational fisheries)

In addition, the Coastal Zone Management Act (CZMA) of 1976, as amended, pertains to the preparation of an EIS. Federal lands are not included in the definition of the coastal zone as prescribed in the CZMA. However, the Act requires that when Federal agencies conduct activities or development that affect the Coastal Zone, that agency's activities or development be consistent to the maximum extent practicable with the approved State Coastal Management Program. This determination is made by the USDA Forest Service.

The Alaska Coastal Management Plan incorporated the Alaska Forest Resources and Practices Act of 1979 as applied standards and guidelines for timber harvesting and processing. The Forest Service Standards and Guidelines and Mitigation Measures described in Chapter Two of this document are equal to or exceed State Standards.



# **Chapter 2**

## **Alternatives**



# Chapter 2

## Alternatives

### Introduction

In this chapter we describe the process we used to develop alternatives to the Proposed Action. We describe the alternatives we are studying in detail, summarize those alternatives we dropped, identify mitigation measures, and briefly compare the alternatives. We also identify a preferred alternative, which is Alternative 3 (see page 2-13 and 2-20).

### Alternative Development

The proposed action is one of many possible approaches to harvesting timber in the Canal Hoya Project Area. This chapter describes three other action alternatives being considered, plus the "no action" alternative. These other alternatives were developed to address the Purpose and Need for the project; to meet Forest Plan standards & guidelines and applicable laws; and to respond to the Key Issues that were identified during our public involvement process. All of the alternatives were designed to address all of the Key Issues and desired conditions for the Project Area to some degree; however the emphasis placed on a given Key Issue or desired condition will vary between alternatives.

Efforts to mitigate effects to scenery, wildlife, Anan bears and water quality have generally been concentrated in the Canal area (VCU 5210), since it is closest to Anan and is therefore most used by Anan bears and is seen by more visitors. Harvest strategies do vary by alternative to address various issues in the Hoya area (VCU 5200); however, the most extensive harvesting is done in that area in all action alternatives.

### Measures Common to All Alternatives

#### Forest Plan Consistency

The alternatives would be consistent with the Revised Forest Plan (USDA 1997a), including the new standards and guidelines described in the Record and Decision for the Forest Plan.

#### GIS Mapping Errors

When mapping is done for large scale planning, such as for the Forest Plan, the data in the GIS database is often not as precise as in small scale planning for projects such as the Canal Hoya Timber Sale. This sometimes results in inconsistencies between the Forest-wide mapping of boundaries for features such as VCUs and Management Prescriptions. We have noted an inconsistency in the Forest Plan mapping of the boundary for the Semi-Remote Recreation Management Prescription area to the east of the Canal Hoya Project Area. The boundary should follow the boundary of VCU 5200, but varies slightly, creating a small sliver (131 acres) of Semi-Remote Recreation Management Prescription in the Hoya VCU. We will correct this mapping error in the Forest-wide database to make the Semi-Remote Recreation Management Prescription area boundary match the boundary of VCU 5200, which will change the management prescription of the sliver to Modified Landscape. We will make this



## 2 Alternatives

change under all of the alternatives. Unit 1, which is proposed in alternatives 1, 3, and 4, is in the sliver of Semi-Remote Recreation Management Prescription created by the mapping error.

### Best Management Practices

Best Management Practices (BMPs) are practices and operating procedures designed to protect water quality. The BMPs are the result of extensive efforts between the Forest Service and the State of Alaska to identify practices that will ensure that timber harvest activities minimize soil erosion and protect aquatic habitat. BMPs would be applied in road location and design, as well as in timber harvest units. The unit and road cards (Appendix A and B) and the log transfer facility design information (Appendix D) describe site specific application of BMPs.

### High Hazard Soils

Slopes greater than 72 percent are generally considered to have a high risk for management induced mass wasting, and are therefore avoided in harvest units proposed in all alternatives. Some units may contain short pitches greater than 72 percent if they are minor inclusions within a unit and have been determined to be stable and suitable for harvest. To comply with Forest Plan standards, a "Slope stability assessment" is completed for all units that contain areas with slopes steeper than 72 percent.

### Locations of Log Transfer Facilities (LTFs) and Roads

LTF locations, when needed, would be consistent among alternatives. At this time, we are considering two options for the site of an LTF in the Hoya VCU. One site is in Capsize Cove, where concerns have been raised about the impacts of LTF activity and debris on an important anchorage for commercial fishing boats, trappers and other users at the site. There is also a sharp-shinned hawk nest that would be affected by an LTF at Capsize Cove. The other option for an LTF in the Hoya VCU is called the Hoya LTF, which is to the east of Capsize Cove. The Hoya LTF site would not interfere with anchoring vessels or raptor nests, but there are two streams near the site that would require careful design of the LTF and road. Road locations would be consistent; however, some segments may not be constructed, depending on the alternative.

### Roads in the Hoya VCU

Road construction would not continue past the "pinchpoint" in the Hoya VCU. The "pinchpoint" is a narrow valley with steep slopes along Hoya Creek, about 1.5 miles from the Hoya estuary. This pinchpoint would make road construction difficult and expensive, and mitigation of impacts to the soil and water resources would be difficult (see discussion for Lower Hoya Reserve Alternative, page 2-5).

### Traffic Management

We would close the roads to motorized vehicles (except for administrative use) after the sale is completed under all action alternatives. Closing roads to motorized use allows the construction of segments of roads across wetlands under a silvicultural exemption to the Clean Water Act. Road closures also mitigate some wildlife concerns; especially regarding increased vulnerability to hunting of Anan bears and mountain goats. Two gates would be installed near the beginning of each road and an administrative closure order would be written. During harvest, the gates would be open, but only administrative use would be allowed. Following completion of the sale, only necessary administrative use, such as regeneration surveys, thinning and future harvests, would be allowed. Non-motorized travel would not be restricted. This strategy is consistent with the Forest Plan objective of avoiding changes to semi-primitive non-motorized settings in Modified Landscape management prescription areas, when feasible (USDA Forest Service 1997, page 3-135).

### Temporary Roads

Temporary roads would be obliterated after use by removing all drainage structures to restore natural drainage patterns, adding waterbars as needed to control runoff, and establishing vegetative cover by seeding or other methods. Red alder (*Alnus rubra*), an invasive species that naturally colonizes disturbed areas, and Sitka spruce are species that would be used.



## Transferring Logs to Saltwater

To address the concern of logging debris interfering with commercial fishing operations in the area, we would attempt to minimize the introduction of limbs and other debris into the ocean. Therefore, helicopters would yard logs to land or barges - no logs would be dropped directly from helicopters into saltwater. We would allow logs to be bundled and placed in saltwater to create rafts for transport.

## Log Transport

Sale administrators would work with the purchaser to avoid log rafts being towed through areas with shrimp pots. This responds to a concern that log transport would disrupt commercial shrimp fishing near the Project Area after October 1, during years harvest operations are being conducted.

## Heritage Resources

Archeological surveys do not indicate that any known sites would be affected by the alternatives as currently designed. If Heritage resources are found prior to or during the timber sale, appropriate mitigation and protection would be designed in consultation with the Alaska State Historic Preservation Officer.

## Harvest Entries

Harvesting all of the available wood during this rotation would require multiple entries. The number and timing of entries would depend on how long it takes harvested units to regenerate consistent with visual standards. In general, a rule-of-thumb used in planning timber sales is that about 25-30% of the suitable forest land can be harvested during the first entry. In this case, standards and guidelines for the Modified Landscape management prescription; desired conditions for other resources - especially Anan bears; the marginal economic value of the timber on much of the land classified as "suitable;" and isolated stands of suitable ground that cannot be reached economically, resulted in harvest units and alternatives that would harvest from 17-22% of the total suitable land during the first entry.

## Harvest Prescriptions

Harvest prescriptions would require retaining some trees in clumps or dispersed through all or a portion of harvest units to maintain visual quality objectives and biodiversity. This strategy is consistent with the Forest Plan objective of reducing clearcutting in Modified Landscape management prescription areas, when other methods will meet land management objectives. Reserve clumps would help meet the desire to provide seed sources to eventually recolonize areas where forbs and shrubs have been shaded out by dense second growth. Reserve clumps and dispersed trees would provide a component of large trees in regenerating stands that would provide habitat for cavity nesting birds, denning bears, marten, marbled murrelets and other species associated with large trees. Where safety permits, reserve trees would include large standing snags, as well as green trees. The reserve trees would be retained in the units throughout the rotation. Four basic harvest prescriptions would be used:

1. Patch Cuts: clearcuts smaller than 9 acres, yarded by helicopter
2. Clearcuts With reserves: at least 10% of the acreage left in reserve clumps
3. Partial Harvest with Diameter Limits: one or more diameter limits
4. Partial Harvest with Diameter Limits and reserves: similar to above, but also includes reserve clumps

## Old Growth Reserves

Old growth reserves would be consistent among alternatives. Small old growth reserves were identified with the intent of selecting one for each of the two Value Comparison Units (5200 and 5210). The reserves were proposed as part of the Forest Plan revision process with input from the Canal Hoya IDT. We consulted with USFWS and ADFG on the location and adequacy of the reserves during the planning process. The location of the reserve in VCU 5210 (Canal) was based primarily on important habitat for bears that use the Anan wildlife viewing area. The reserve in VCU 5200 (Hoya) includes important mountain goat and deer winter habitat, maintains corridors to other old growth blocks, and minimizes impacts to the

## 2 Alternatives

economically harvestable timber base by locating it beyond a narrow pinchpoint (see page 2-5). The size of the reserve was selected before the criteria in the Forest Plan were finalized, so the current total size of the reserve is smaller than the 16% of the VCU specified in the Forest Plan. The current Hoya reserve does contain the necessary amount of Productive Old Growth. The area to the south of the Hoya reserve is isolated from timber harvest by the location of the reserve and would serve the same function as a portion of the reserve. We will make a non-significant amendment to the Forest Plan to increase the size of the reserve by adding the isolated area to the south, which is currently designated Timber Production management prescription, but cannot be accessed for timber management. This will increase the size of the Hoya old growth reserve by approximately 7800 acres, of which 196 acres were classified in Forest Plan calculations as isolated, but suitable for timber production. See page 3-61 for more detail on the old growth reserves.

### Helicopter Flight Restrictions

- Helicopter yarding would not be done in the Canal VCU between May 1 - June 15, to avoid disturbance to bears with cubs upon emergence from hibernation.
- Helicopter flights associated with harvest operations would be restricted within 2 miles of the Anan Wildlife Viewing Area from July 1 - August 31 in an effort to reduce disturbance to bears and wildlife viewers during the peak season at Anan.
- Repeated helicopter flights within 1/4 mile of eagle nest trees would be avoided from March 1 - May 31. If nests have young, we would extend the protection to August 31.
- Helicopters would be restricted from flying near sea lion haulouts and whales.
- Helicopters would maintain at least 1,000 foot vertical and horizontal distance from visible mountain goats. There would be no sightseeing of goats.

### Nests

Harvest would not take place within 600 feet of an active raptor or marbled murrelet nest. Unit 25 was modified to meet this measure. If other nests are found in or near harvest units, the boundaries would be modified.

### Bear Dens

- Dens found within trees in areas to be harvested would be retained.
- No activities are proposed within 100 feet of any known bear dens in any alternative. If an active den is found after the project begins, activities within 100 feet of the den would be avoided until the bear leaves of its own volition. This is to protect nursing cubs, since black bears have been reported to abandon dens and their cubs when closely approached by humans or other predators (Davis 1996).
- In specified units (Appendix A), down logs and snags (where safety permits) would be retained to provide den sites. Logs should be 40" in diameter and 15 feet long.
- In specified units (Appendix A), selected large trees would be cut at least 6 feet above their base (high stumping) to allow for the formation of den sites under the stumps.

### Brown Bear Foraging Areas

Hoya Creek, Survey Creek and Surho Creek were identified as important brown bear foraging areas by the Alaska Department of Fish and Game. No harvesting will be done within 500 feet of the portions of those streams where salmon spawn. Two potential units were dropped from further consideration to protect these important foraging areas.

### Wetlands

Because wetlands are so extensive in the project area, it is not feasible to avoid all wetland areas. However, there are no development activities planned on the more biologically significant wetlands. There would be no direct effects to the fens, estuarine wetlands, or the lake fringe wetlands. In all alternatives, roads and units were located to avoid these areas. Roads and other facilities would be constructed at least 1000' from estuaries, where feasible. Tables 3-29 and 3-30 on page 3-96 displays the length of road and acres of harvest proposed by alternative on the different wetland types.

## Alternatives Considered, but Eliminated From Further Review

### Lower Hoya Reserve Alternative

We considered an alternative that would move the location of the small old growth reserve in the Hoya VCU to the coastline. The theme of this alternative would be to emphasize bear habitat security in the Canal VCU and to increase the volume available for harvest in the Hoya VCU by putting the Old Growth Reserve in a location where much of the acreage would already be retained due to beach, estuary and riparian buffers. Accessing the timber that would be available in upper Hoya drainage would require constructing a road beyond a narrow valley pinchpoint.

The narrow valley pinchpoint along Hoya Creek would make it difficult and expensive to construct a road beyond the point. Getting around the pinchpoint would require two 80 foot bridges (about \$130,000 each) and several major drainage structures. Although feasible from an engineering standpoint, the double bridge site would impact the floodplain and side channels at the location of some of the highest value resident fish habitat in Hoya Creek. There is a risk of flood constriction and subsequent up and downstream channel erosion at this narrow site. In addition, much of the timber available above the pinchpoint is located on terrain steeper than is recommended under Forest Plan guidelines. In response to these concerns, as well as cost effectiveness, we concluded that road construction beyond the pinchpoint was not consistent with the desired conditions for the area. Keeping the old growth reserve south of the pinchpoint would therefore only affect a few units accessible by helicopter, so the alternative with a reserve in the lower portion of Hoya watershed was eliminated from detailed study.

### Upper Canal Reserve Option

We considered including an option to move the Old Growth Reserve in the Canal VCU to a location south of the powerline, adjacent to the Anan watershed (VCU 5220) in alternatives 1, 3, and 4. The theme of this option would be to promote long-term bear habitat security by avoiding road construction adjacent to the Anan watershed and in an area our telemetry study discovered bear dens. Although this option would promote long-term bear habitat security where the reserve would be located, the original reserve location, as identified in the Forest Plan, would then be selected for harvest. The original reserve location also includes known bear dens and is more sensitive in regard to visual objectives and possibly would result in more noise and disruption to visitors and bears at and near the Anan Wildlife Viewing Area. Therefore, this option was eliminated from detailed study.

### Alternative with Roads Only as Far as Powerline

We considered an alternative that would have emphasized maintaining the volume of timber available for harvest, while promoting bear habitat security, soil and water quality and visual concerns over conventional logging methods. LTFs and roads would have been constructed in both VCUs, but the roads would only extend to suitable landings south of the powerline. Cable yarding would have been used in units along the main road, but the primary system would be helicopter yarding north and south of the powerline. As we developed this alternative, it became apparent that due to the terrain in the Hoya VCU, it would be necessary to have at least two roads to the powerline to allow efficient helicopter yarding, which would make it similar to Alternative 1. If only one road was constructed, the alternative would appear similar to components covered in alternative 4. Therefore, the additional alternative did not warrant further review.



## 2 Alternatives

### **Cable Yarding Only Alternative**

We considered an alternative that would only harvest units accessible by roads for cable yarding. The theme of this alternative was to emphasize logging economics by designing a sale that would not require helicopter yarding, which is assumed to reduce the benefit/cost ratio for timber harvesting. Such an alternative would greatly limit our ability to meet the desired condition of leaving varying densities of trees to create multi-structured stands, as well as the desire to manage for timber production on land that is in the suitable base, but not accessible by road. Therefore, this alternative was eliminated from detailed study.

### **Helicopter Yarding Only Alternative**

We considered an alternative that would have deferred road construction and emphasized the use of partial harvest methods in units that are visible from the water or are in high value wildlife habitat. The theme of this alternative was to emphasize wildlife habitat and security, visual objectives, and water quality, while maintaining the economic viability of future harvests. All harvest activity would be north of the powerline and yarding would be done by helicopter. There would be no roads or LTF. This strategy is consistent with the Forest Plan objective of avoiding changes to semi-primitive non-motorized settings in Modified Landscape management prescription areas, when feasible. Some of the suitable cable ground along the potential main road corridor would be deferred from harvest this entry in order to maintain the option of a viable cable harvest alternative in future entries. Harvesting sufficient timber volume to meet the Purpose and Need for this project would have required adding units to this alternative that would not have met our desires for the scenic resource nor left enough timber along potential road corridors to maintain the economic viability of road construction for future entries. Therefore this alternative was eliminated from detailed study.



## Alternatives Considered in Detail

### Alternative 1, Proposed Action

The theme of this alternative is to emphasize timber volume and harvest economics in the Hoya VCU and balance bear habitat security, visual concerns, water quality, and timber production in the Canal VCU. In the Hoya VCU, an LTF and roads would be constructed to allow cable yarding, which is assumed to be the least costly yarding method, in as many units as practical, while still meeting standards and guidelines and desired conditions for other resources. Other units in the Hoya VCU would be harvested using helicopter yarding to provide additional volume.

In the Canal VCU, resource concerns would be addressed by minimizing road construction and retaining higher percentages of trees than are retained in units in the Hoya VCU. A road would extend from an LTF to a suitable landing about 0.25 miles south of the powerline and yarding would be done by helicopter from all units that are not accessed by the main road. Only units on ground that could not be accessed by cable yarding in future entries were selected for helicopter yarding in the Canal VCU. This would maintain the economic viability of extending the road in the future. This document does not determine future actions, but does allow for the possibility of a road if monitoring after this entry showed the effects on Anan bears was minimal.

This alternative would allow adaptive management by providing time to determine if road management ideas are effective in mitigating concerns for wildlife habitat security, and water quality, before extending the road system in the Canal VCU. Monitoring described in Appendix C would also allow adaptive management of harvest prescriptions in future entries.

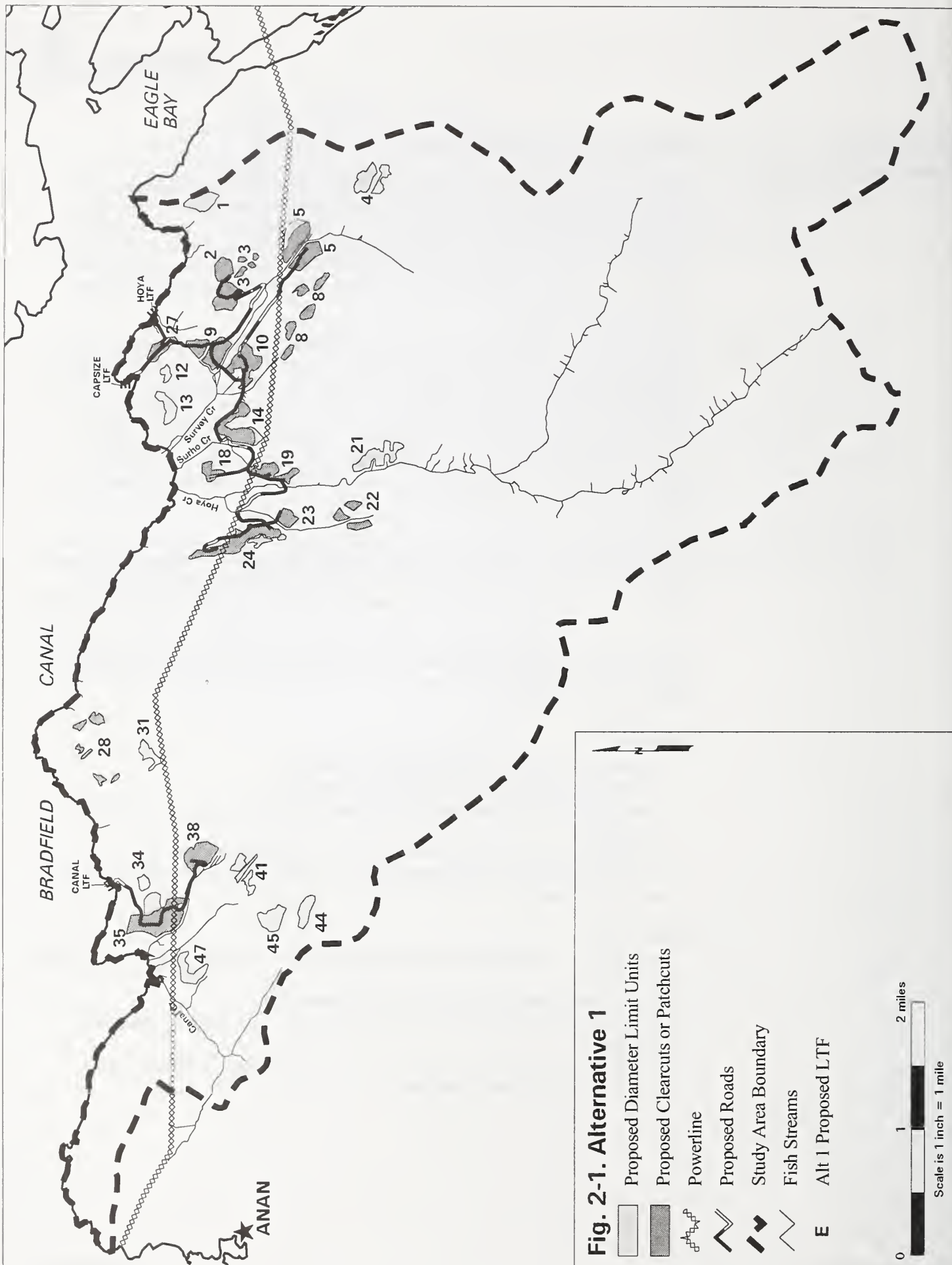
About 9 miles of specified road and 2 miles of temporary road would be needed. About 16 MMBF would be harvested on 780 acres. This would entail harvesting approximately 20% of the suitable forest land in the first entry. Table 2-1 and Figure 2-1 display the specific activities for this alternative.

#### HOYA VCU:

- Emphasis is on timber volume and harvest economics.
- Primarily cable yarding, with some helicopter yarding.
- Areas suitable for cable yarding, but not accessed by the road, would be deferred for future entries.
- A road system would be constructed from an LTF to access cable ground.
- Harvest prescriptions would be primarily clearcut-with-reserves and some diameter limit and patch cut units.

#### CANAL VCU:

- Emphasis is on balancing bear habitat security, visual concerns, water quality, and timber production.
- Primarily helicopter yarding, with some cable yarding.
- A road would be constructed from an LTF to a landing about 0.25 miles south of the powerline.
- A mix of harvest prescriptions would be used, with diameter limit being the primary prescription near the Anan watershed.



**Table 2-1**  
**Alternative 1 Harvest Units**

| Unit | Silvicultural Harvest Method                         | Acres | Yarding Method |
|------|--|-------|----------------|
| 1    | Partial harvest with diameter limit                  | 22    | Helicopter     |
| 2    | Clearcut with 25% reserves                           | 18    | Helicopter     |
| 3    | Clearcut with 10% reserves                           | 30    | Cable          |
|      | Patch cuts less than 8 acres each                    | 10    | Helicopter     |
| 4    | Partial harvest with diameter limit                  | 32    | Helicopter     |
| 5    | Partial harvest with diameter limit                  | 12    | Helicopter     |
|      | Clearcut with 10% reserves                           | 51    | Cable          |
| 8    | Patch cuts less than 8 acres each                    | 32    | Helicopter     |
| 9    | Clearcut with 10% reserves                           | 41    | Cable          |
| 10   | Clearcut with 10% reserves, feather backline         | 38    | Cable          |
| 12   | Partial harvest with diameter limit                  | 6     | Helicopter     |
| 13   | Partial harvest with diameter limit                  | 18    | Helicopter     |
| 14   | Clearcut with 10% reserves, feather backline         | 38    | Cable          |
|      |  | 5     | Helicopter     |
| 18   | Clearcut with 10% reserves                           | 13    | Cable          |
| 19   | Clearcut with 10% reserves, feather backline         | 25    | Cable          |
| 21   | Partial harvest with diameter limit                  | 34    |                |
| 22   | Patch cuts less than 8 acres each                    | 20    | Helicopter     |
| 23   | Clearcut with 10% reserves                           | 13    | Helicopter     |
| 24   | Clearcut with 10% reserves                           | 51    | Cable          |
|      | Partial harvest with diameter limit in upper portion | 9     | Helicopter     |
| 27   | Clearcut with 10% reserves                           | 18    | Cable          |
| 28   | Patch cuts less than 8 acres each                    | 21    | Helicopter     |
| 31   | Partial harvest with diameter limit                  | 14    | Helicopter     |
| 34   | Partial harvest with diameter limit                  | 8     | Helicopter     |
| 35   | Clearcut with 10% reserves                           | 64    | Cable          |
|      | Partial harvest with diameter limit                  | 16    | Helicopter     |
| 38   | Clearcut with 30% reserves, feather backline         | 33    | Cable          |
| 41   | Partial harvest with diameter limit                  | 22    | Helicopter     |
| 44   | Partial harvest with diameter limit and reserves     | 17    | Helicopter     |
| 45   | Partial harvest with diameter limit                  | 25    | Helicopter     |
| 47   | Partial harvest with diameter limit                  | 23    | Helicopter     |

## Alternative 2

The theme of this alternative is to emphasize timber volume, infrastructure development and long-term harvest economics throughout the Project Area. This alternative requires the most road construction - about 11 miles of specified and 3 miles of temporary road - to reach most of the areas accessible by cable yarding systems. Helicopter yarding would be used to access additional timber volume where economically feasible. Helicopter yarding would also be used to feather backlines of some units.

Desired conditions for other resources would be promoted where compatible with the theme of this alternative. For instance, trees are retained in all units to maintain structural diversity in the regenerating stand, provide wildlife habitat and meet visual quality objectives. However, the amount of retention in this alternative is generally less than would be retained in the same units in other alternatives. Some unit sizes and shapes were adjusted to maintain wildlife dispersal corridors, protect important habitat and enhance visuals. Most unit boundaries are based on the suitability of the terrain for cable yarding and the quality of the timber.

This alternative would be the least conducive to adaptive management, since the complete road system would be built during the first entry. Monitoring described in Appendix C would allow adaptive management of harvest prescriptions in future entries.

About 17 MMBF would be harvested on 800 acres. This would entail harvesting approximately 21% of the suitable forest land in the first entry. Table 2-2 and Figure 2-2 display the specific activities for this alternative.

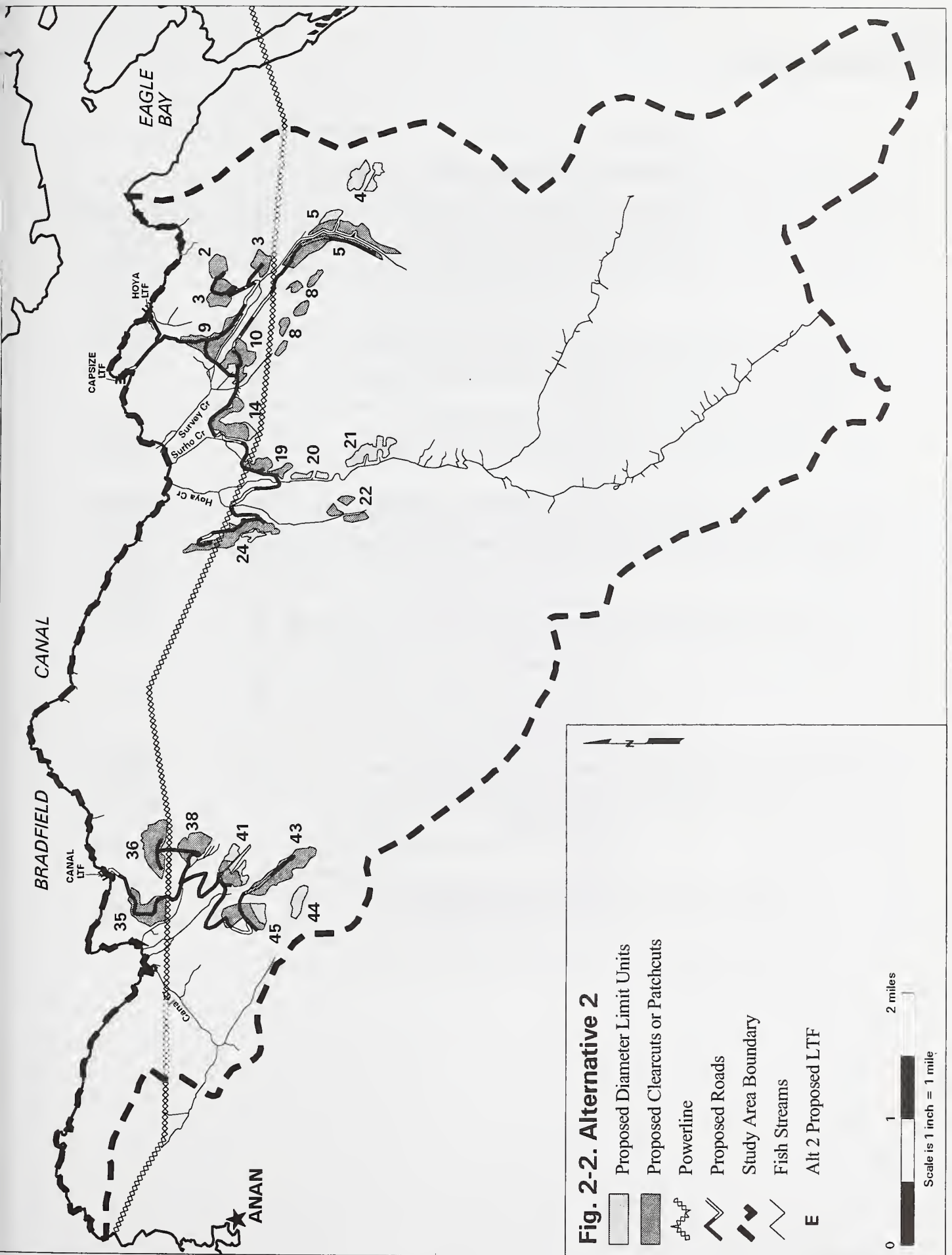
### HOYA VCU:

- Emphasis is on timber volume and harvest economics.
- Primarily cable yarding, with some helicopter yarding.
- A road system would be constructed from an LTF to access cable ground.
- Harvest prescriptions would be primarily clearcut-with-reserves and some diameter limit and patch cuts.

### CANAL VCU:

- Emphasis is on timber volume and harvest economics.
- Primarily cable yarding, with some helicopter yarding.
- A road system would be constructed from an LTF to access cable ground.
- Harvest prescriptions would be primarily clearcut-with-reserves and some diameter limit and patch cut units.





## 2 Alternatives

Table 2-2  
Alternative 2 Harvest Units

| Unit | Silvicultural Harvest Method                            | Acres | Yarding Method |
|------|---|-------|----------------|
| 2    | Clearcut with 25% reserves                              | 18    | Cable          |
| 3    | Clearcut with 10% reserves                              | 48    | Cable          |
| 4    | Partial harvest with diameter limit                     | 32    | Helicopter     |
| 5    | Clearcut with 20% reserves                              | 86    | Cable          |
|      | Partial harvest with diameter limit                     | 9     | Helicopter     |
| 8    | Patch cuts less than 8 acres each                       | 32    | Helicopter     |
| 9    | Clearcut with 30% reserves                              | 49    | Cable          |
| 10   | Clearcut with 10% reserves, feather backline            | 38    | Cable          |
| 14   | Clearcut with 10% reserves                              | 38    | Cable          |
|      | Partial harvest with diameter limit                     | 5     | Helicopter     |
| 19   | Clearcut with 10% reserves, feather backline            | 25    | Cable          |
| 20   | Partial harvest with diameter limit                     | 10    | Helicopter     |
| 21   | Partial harvest with diameter limit                     | 34    | Helicopter     |
| 22   | Patch cuts less than 8 acres each                       | 20    | Helicopter     |
| 24   | Clearcut with 10% reserves                              | 51    | Cable          |
|      | Partial harvest with diameter limit                     | 9     | Helicopter     |
| 35   | Clearcut with 10% reserves                              | 47    | Cable          |
| 36   | Clearcut with 10% reserves                              | 52    | Cable          |
|      | Partial harvest with diameter limit to feather backline |       |                |
| 38   | Clearcut with 10% reserves                              | 33    | Cable          |
|      | Partial harvest with diameter limit to feather backline |       |                |
| 41   | Clearcut with 10% reserves                              | 18    | Cable          |
|      | Partial harvest with diameter limit                     | 22    | Helicopter     |
| 43   | Clearcut with 20% reserves                              | 58    | Cable          |
|      | Partial harvest with diameter limit to feather backline |       | Helicopter     |
| 44   | Partial harvest with diameter limit and reserves        | 17    | Helicopter     |
| 45   | Clearcut with 15% reserves                              | 33    | Cable          |
|      | Partial harvest with diameter limit                     | 12    | Helicopter     |

## Alternative 3

The theme of this alternative is to emphasize Anan bear habitat security, water quality, and visual concerns in the **Canal** VCU and to emphasize timber volume and harvest economics in the **Hoya** VCU. This alternative is similar to alternative 2 in the Hoya VCU, since roads and most harvest units would be the same. A few more helicopter yarding units were included in the Hoya VCU in this alternative to balance the reduction in units in the Canal VCU, compared to other alternatives. About 7 miles of specified road and 2 miles of temporary road would be needed in VCU 5200 (Hoya).

No roads would be constructed in the Canal VCU. Helicopter yarding would be used to harvest timber north of the powerline in VCU 5210 (Canal). Helicopter yarding allows more flexibility in harvest prescriptions, so diameter limit and patch cut prescriptions would be used to reduce visual impacts and to maintain a component of large trees in the future stand, which would benefit wildlife. Future harvest in the Canal VCU could use cable and/or helicopter yarding south of the powerline. Some of the suitable cable ground along the potential main road corridor in the Canal VCU would be deferred from harvest this entry in order to maintain the option of a viable cable harvest alternative in future entries.

This alternative would allow adaptive management by providing time to determine if road management ideas are effective in mitigating concerns for wildlife habitat security, and water quality in the Hoya VCU before constructing a road system in the Canal VCU. Monitoring described in Appendix C would also allow adaptive management of harvest prescriptions in future entries.

About 15 MMBF would be harvested on 700 acres. This would entail harvesting approximately 18% of the suitable forest land in the first entry. Table 2-3 and Figure 2-3 display the specific activities for this alternative.

### HOYA DRAINAGE:

- Emphasis is on timber volume and harvest economics.
- Primarily cable yarding, with some helicopter yarding.
- Most units would be the same as in alternative 2, with some additional helicopter units.
- A road system would be constructed from an LTF to access cable ground.
- Harvest prescriptions would be primarily clearcut-with-reserves and some diameter limit and patch cut units.

### CANAL DRAINAGE:

- Emphasis is on bear habitat security, water quality, and visual concerns.
- Harvest would take place by helicopter yarding only north of the powerline.
- No roads or LTF would be constructed in this VCU.
- Harvest prescriptions would be primarily diameter limit and patch cut.

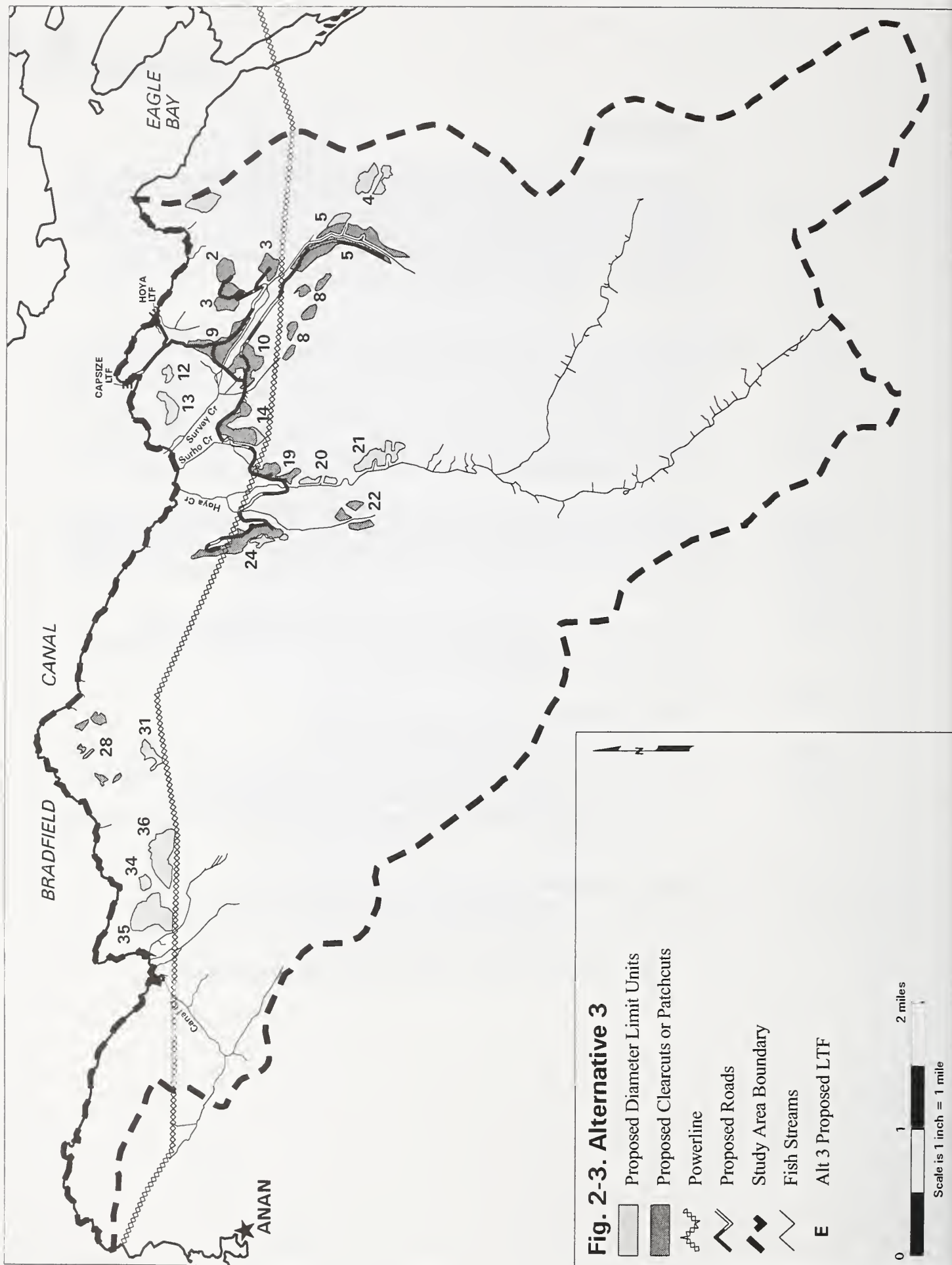




Table 2-3

**Alternative 3 Harvest Units**

| Unit | Silvicultural Harvest Method                         | Acres | Yarding Method |
|------|--|-------|----------------|
| 1    | Partial harvest with diameter limit                  | 22    | Helicopter     |
| 2    | Clearcut with 10% reserves                           | 18    | Cable          |
| 3    | Clearcut with 25% reserves                           | 48    | Cable          |
| 4    | Partial harvest with diameter limit                  | 32    | Helicopter     |
| 5    | Clearcut with 20% reserves                           | 86    | Cable          |
|      | Partial harvest with diameter limit                  | 9     | Helicopter     |
| 8    | Patch cuts less than 8 acres each                    | 32    | Helicopter     |
| 9    | Clearcut with 30% reserves                           | 49    | Cable          |
| 10   | Clearcut with 10% reserves, feather backline         | 38    | Cable          |
| 12   | Partial harvest with diameter limit                  | 6     | Helicopter     |
| 13   | Partial harvest with diameter limit                  | 18    | Helicopter     |
| 14   | Clearcut with 10% reserves                           | 38    | Cable          |
|      | Partial harvest with diameter limit                  | 5     | Helicopter     |
| 19   | Clearcut with 10% reserves, feather backline         | 25    | Cable          |
| 20   | Partial harvest with diameter limit                  | 10    | Helicopter     |
| 21   | Partial harvest with diameter limit                  | 34    | Helicopter     |
| 22   | Patch cuts less than 8 acres each                    | 20    | Helicopter     |
| 24   | Clearcut with 10% reserves                           | 51    | Cable          |
|      | Partial harvest with diameter limit in upper portion | 9     | Helicopter     |
| 28   | Patch cuts less than 8 acres each                    | 21    | Helicopter     |
| 31   | Partial harvest with diameter limit                  | 14    | Helicopter     |
| 34   | Partial harvest with diameter limit                  | 8     | Helicopter     |
| 35   | Partial harvest with diameter limit                  | 57    | Helicopter     |
| 36   | Partial harvest with diameter limit                  | 52    | Helicopter     |

## Alternative 4

The theme of this alternative is to emphasize wildlife habitat and security, visual objectives, and water quality. The theme would be met by minimizing road construction and emphasizing the use of partial harvest methods in units that are visible from the water or are in high value wildlife habitat. Due to the heavy harvest proposed in the seen area, retention within units is generally higher than that proposed in other alternatives, in order to reduce visual impacts.

All harvest activity in the Canal VCU would be north of the powerline and yarding would be done by helicopter. There would be no roads or LTF in the Canal VCU. Some of the suitable cable ground along the potential main road corridor in the Canal VCU would be deferred from harvest this entry in order to maintain the option of a viable cable harvest alternative in future entries.

In the Hoya drainage, a road would extend from an LTF to a suitable landing about 0.25 miles south of the powerline and yarding would be done by helicopter for all units that are not accessed by the main road. About 3 miles of specified road would be needed in VCU 5200 (Hoya).

This alternative would be the most conducive to adaptive management by providing time to determine if road management ideas are effective in mitigating concerns for wildlife habitat security, and water quality in the Hoya VCU before constructing a road system in the Canal VCU or extending the road system in the Hoya VCU. Monitoring described in Appendix C would also allow adaptive management of harvest prescriptions in future entries.

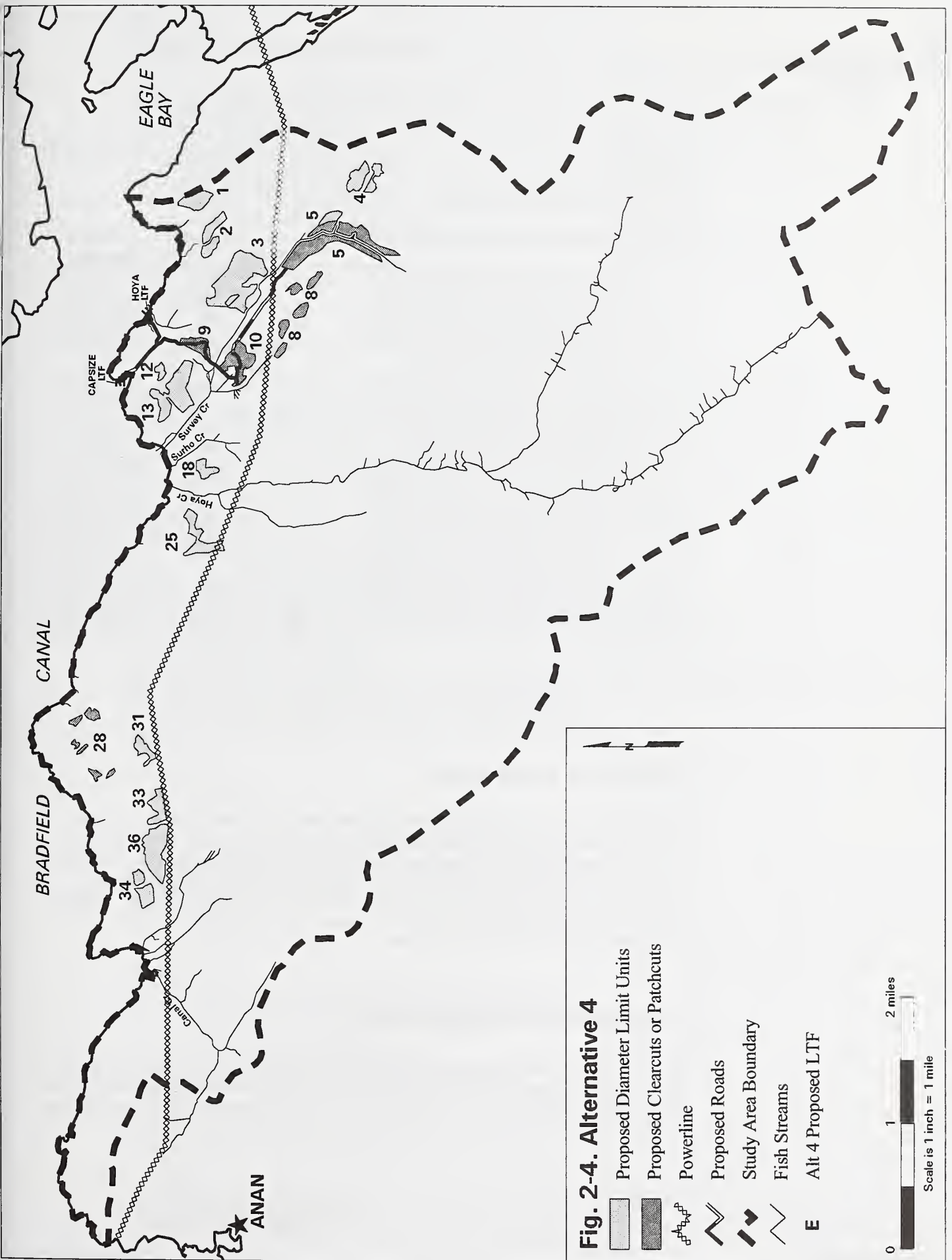
About 12 MMBF would be harvested on 610 acres. This would entail harvesting approximately 16% of the suitable forest land in the first entry. Table 2-4 and Figure 2-4 display the specific activities for this alternative.

### HOYA VCU:

- Emphasis is on wildlife habitat and security, visual objectives, and water quality.
- Primarily helicopter yarding, with some cable yarding.
- A road would be constructed from an LTF to a sort yard about 0.25 miles south of the powerline.
- Harvest prescriptions would be primarily diameter limit to maintain visual objectives and wildlife habitat.

### CANAL VCU:

- Emphasis is on wildlife habitat and security, visual objectives, and water quality.
- Harvest would take place by helicopter yarding only north of the powerline.
- No roads or LTF would be constructed in this VCU.
- Some suitable timber along main road corridors would be deferred this entry to maintain future options.
- Harvest prescriptions would be primarily diameter limit to maintain visual objectives and wildlife habitat.



## 2 Alternatives

Table 2-4  
Alternative 4 Harvest Units

| Unit | Silvicultural Harvest Method        | Acres | Yarding Method |
|------|-------------------------------------|-------|----------------|
| 1    | Partial harvest with diameter limit | 22    | Helicopter     |
| 2    | Partial harvest with diameter limit | 26    | Helicopter     |
| 3    | Partial harvest with diameter limit | 98    | Helicopter     |
| 4    | Partial harvest with diameter limit | 32    | Helicopter     |
| 5    | Clearcut with 20% reserves          | 86    | Cable          |
|      | Partial harvest with diameter limit | 9     | Helicopter     |
| 8    | Patch cuts less than 8 acres each   | 32    | Helicopter     |
| 9    | Clearcut with 30% reserves          | 20    | Cable          |
| 10   | Clearcut with 20% reserves          | 38    | Cable          |
| 12   | Partial harvest with diameter limit | 6     | Helicopter     |
| 13   | Partial harvest with diameter limit | 63    | Helicopter     |
| 18   | Partial harvest with diameter limit | 13    | Helicopter     |
| 25   | Partial harvest with diameter limit | 32    | Helicopter     |
| 28   | Patch cuts less than 8 acres each   | 21    | Helicopter     |
| 31   | Partial harvest with diameter limit | 14    | Helicopter     |
| 33   | Partial harvest with diameter limit | 22    | Helicopter     |
| 34   | Partial harvest with diameter limit | 23    | Helicopter     |
| 36   | Partial harvest with diameter limit | 52    | Helicopter     |

### Alternative 5, No Action

This alternative measures the effects of having no timber sale or road construction in the Canal Hoya Project Area. This alternative is provided so you can see the changes that the other alternatives have on the social, physical and biological environment. This alternative is most responsive to Scenic and tourism values, Anan bears, wildlife habitat and species conservation, freshwater and marine resources, by deferring harvest. It would not contribute to local employment or harvest economics. The existing condition would continue to be influenced by natural disturbance processes.

### Alternative Comparison

Table 2-5 compares treatment acres, predicted harvest volume and environmental impacts for each of the action alternatives. It is important to note that differences in harvest prescriptions would result in different harvest volumes per acre. The environmental impacts are discussed in detail in Chapter 3.



Table 2-5

**Alternative Comparison Table**

|  | Alt 1      | Alt 2      | Alt 3      | Alt 4      | Alt 5<br>No Action |
|--|------------|------------|------------|------------|--------------------|
| <b>Total Acres Classified as Suitable for Harvest</b>                      | 3670       | 3670       | 3670       | 3670       | 3670               |
| <b>Proposed Treatment Acres</b>  | <b>780</b> | <b>800</b> | <b>700</b> | <b>610</b> |                    |
| Canal Creek VCU  | 230        | 290        | 140        | 120        | 0                  |
| Hoya Creek VCU   | 550        | 510        | 560        | 489        | 0                  |
| <b>Harvest by Volume Strata (acres)</b>                                    |            |            |            |            |                    |
| Low Volume (2120 acres existing)   | 85         | 40         | 60         | 110        | 0                  |
| Medium Volume (5800 acres existing)  | 415        | 395        | 340        | 290        | 0                  |
| High Volume (4500 acres existing)  | 280        | 365        | 300        | 210        | 0                  |
| <b>% of Suitable Treated</b>   | 21%        | 22%        | 19%        | 17%        | 0                  |
| <b>Total Volume (MMBF)</b>   | <b>16</b>  | <b>17</b>  | <b>15</b>  | <b>12</b>  | <b>0</b>           |
| Cable Yarded   | 8.2        | 11.5       | 7.0        | 1.3        | 0                  |
| Helicopter Yarded  | 7.3        | 4.9        | 7.5        | 10.8       | 0                  |
| ROW Volume   | .5         | .7         | .4         | .2         | 0                  |
| <b>Net Stumpage (\$/MBF)</b>   |            |            |            |            |                    |
| Hoya LTF Option  | -\$133     | -\$137     | -\$124     | -\$107     | 0                  |
| Capsize Cove LTF Option  | -\$139     | -\$142     | -\$130     | -\$114     | 0                  |
| <b>Number of Direct Jobs Produced During Life of Sale</b>                  | 69         | 74         | 65         | 53         | 0                  |
| <b>Specified Road (miles):</b> Hoya LTF Option                             | 8.5        | 11.3       | 7.3        | 2.6        | 0                  |
| Capsize Cove LTF Option  | 8.7        | 11.5       | 7.4        | 2.8        | 0                  |
| <b>Temporary Road</b>  | 1.6        | 2.8        | 1.6        | 0          | 0                  |
| <b>Total Road Miles:</b> Hoya LTF Option                                   | 10.1       | 14.1       | 8.8        | 2.6        | 0                  |
| Capsize Cove LTF Option  | 10.3       | 14.2       | 9.0        | 2.8        | 0                  |
| <b>Log Transfer Sites</b>  | 2          | 2          | 1          | 1          | 0                  |
| <b>Visibility</b> From Blake Island  |            | most       |            | least      |                    |
| From Mouth of Canal Creek  |            | most       |            | least      |                    |
| From Mouth of Hoya Creek   | most       |            |            | least      |                    |
| <b>Harvest by Visual Management Class (acres)</b>                          |            |            |            |            |                    |
| Visual Management Class 2  | 300        | 350        | 240        | 190        | 0                  |
| Visual Management Class 3  | 370        | 300        | 310        | 350        | 0                  |
| Visual Management Class 4  | 110        | 150        | 150        | 70         | 0                  |
| <b>Duration of Operations (years)</b>                                      | 3-5        | 3-5        | 3-4        | 2-3        | 0                  |
| <b>Brown Bear Denning Habitat Harvested (1985 acres existing)</b>          | 73         | 134        | 89         | 80         | 0                  |
| <b>% of Anan Bear Locations Within 1 Mile of Proposed Roads</b>            | 12%        | 13%        | 6%         | 2%         | 0                  |
| <b>% of Highly Suitable Habitat in Project Area Reduced in Quality for</b> |            |            |            |            |                    |
| Black Bear   | 56         | 60         | 40         | 26         | 0                  |
| Brown Bear   | 4          | 3          | 3          | 2          | 0                  |
| Mountain Goat  | 3          | 55         | 54         | 3          | 0                  |
| Deer (Medium Suitable Habitat Reduced in Quality)                          | 18         | 16         | 15         | 6          | 0                  |
| Marten   | 9          | 10         | 8          | 6          | 0                  |
| Goshawk  | 5          | 6          | 6          | 5          | 0                  |
| <b>Project Area Habitat Capability as a % of Current Condition</b>         |            |            |            |            |                    |
| Black Bear   | 84         | 81         | 87         | 91         | 100                |
| Brown Bear   | 92         | 90         | 94         | 96         | 100                |
| Mountain Goat  | 91         | 87         | 89         | 95         | 100                |
| Deer   | 92         | 92         | 94         | 95         | 100                |
| Marten   | 95         | 95         | 95         | 96         | 100                |
| <b>Drainage Structures on Fish Streams</b>                                 | 14         | 15         | 12         | 2          | 0                  |
| <b>Harvest in Watersheds with the Most Fish Habitat (acres)</b>            |            |            |            |            |                    |
| Canal (4.1 miles of fish stream)   | 60         | 65         | 0          | 0          | 0                  |
| Hoya (18.9 miles of fish stream)   | 140        | 135        | 135        | 5          | 0                  |
| Survey (5.8 miles of fish stream)  | 275        | 305        | 325        | 385        | 0                  |
| <b>% Watershed Harvest in Most Sensitive Watersheds</b>                    |            |            |            |            |                    |
| Hoya   | 1%         | 1%         | 1%         | 0          | 0                  |
| Survey   | 7%         | 8%         | 8%         | 10%        | 0                  |
| <b>Road Miles in Watersheds with the Most Fish Habitat</b>                 |            |            |            |            |                    |
| Canal  | 0          | 1.0        | 0          | 0          | 0                  |
| Hoya   | 2.2        | 2.0        | 2.0        | 0          | 0                  |
| Survey   | 4.3        | 5.2        | 5.2        | 2.1        | 0                  |
| <b>Volume Through LTFs (MMBF)</b>  | 15         | 17         | 12         | 8          | 0                  |
| <b>Volume to Barge (MMBF)</b>  | 1          | 0          | 3          | 4          | 0                  |

### Preferred Alternative

The **Preferred Alternative** is Alternative 3. At this time, we feel that Alternative 3 is the best possible alternative because:

- It addresses the issue of vulnerability of Anan bears by not building a road in the Canal VCU.
- Effects of this Alternative would be less noticeable from the Eastern Passage Travel Route near Blake Island than those of alternatives requiring road construction in the Canal VCU.
- The desired condition for scenic values of Partial Retention from the Eastern Passage Travel Route would be met in the Canal VCU.
- This alternative allows a high potential for adaptive management by allowing us to monitor the impacts of road construction and use in the Hoya VCU, before deciding whether to construct roads in the Canal VCU in the next entry.
- Although Alternative 4 addresses the above points to a greater extent, Alternative 3 balances those issues with timber volume and associated jobs better than Alternative 4.

**This recommendation is not a decision.** The primary purpose of this DEIS is to inform you about our analysis and about what we perceive at this time to be the best approach for management of the Canal Hoya Project Area, and to find out what you think about it *before* we make a decision. We want to hear whether you think we have addressed the issues adequately under each alternative. Once we have your input, we will consider the need to revise, drop or add issues, alternatives, or roads and units within alternatives. If so, additional analyses would be conducted and this DEIS would be revised to become the *Final Environmental Impact Statement* (FEIS). The Forest Supervisor will then use the information in the FEIS and your comments to make a final decision. The final decision, which may be different from what we are recommending at this point in the DRAFT, would be documented in a Record of Decision. If you would like to provide comments to this DEIS, you may write to us at Wrangell Ranger District, ATTN.: Canal Hoya Team, PO Box 51, Wrangell AK 99929. If you would like to visit or call us, we are located at 525 Bennett Street in Wrangell and our phone number is (907) 874-2323.

# **Chapter 3**

## **Affected Environment and Environmental Effects**





# **Chapter 3**

## **Affected Environment and Environmental Effects**

### **Introduction**

In this chapter, we describe the environment that would potentially be modified by this project (affected environment), and the effects of the five alternatives on the environment (environmental effects). This chapter is divided into two main sections:

**Effects on the Key Issues** - In this section, we will describe the effects of each alternative on the five key issues.

**Other Environmental Considerations** - In this section we discuss some of the other environmental considerations required by various laws.

### **Effects on the Key Issues**

The Council on Environmental Quality (CEQ) issues guidance to Federal Agencies to determine the significant issues concerning any proposal, and to eliminate those issues that are not significant. With the help of the public and other agencies, we identified five issues that were significant enough to be examined in detail, given the nature of the preferred action. In this section, we describe the environmental effects associated with these five issues.

# 3 Environment and Effects

## Issue One: Timber Supply and Economics

This project has the potential to affect employment and the economy of local communities, which was brought up as an issue during public scoping. Public comments indicated concern about current changes in the timber industry, particularly regarding the pulp products from this sale and questions about the need for the sale given the recent mill closures. The terrain and quality of timber in the project area may make it difficult to design a timber sale that would be advertised above base rates, so the economic viability of a sale is also an issue. The amount of wood harvested, the location of old growth reserves and any infrastructure developed with this entry may affect availability and costs associated with future entries for timber harvest.

### Timber Supply

#### *Timber Supply is Based on the Existing Project Area Land Classification*

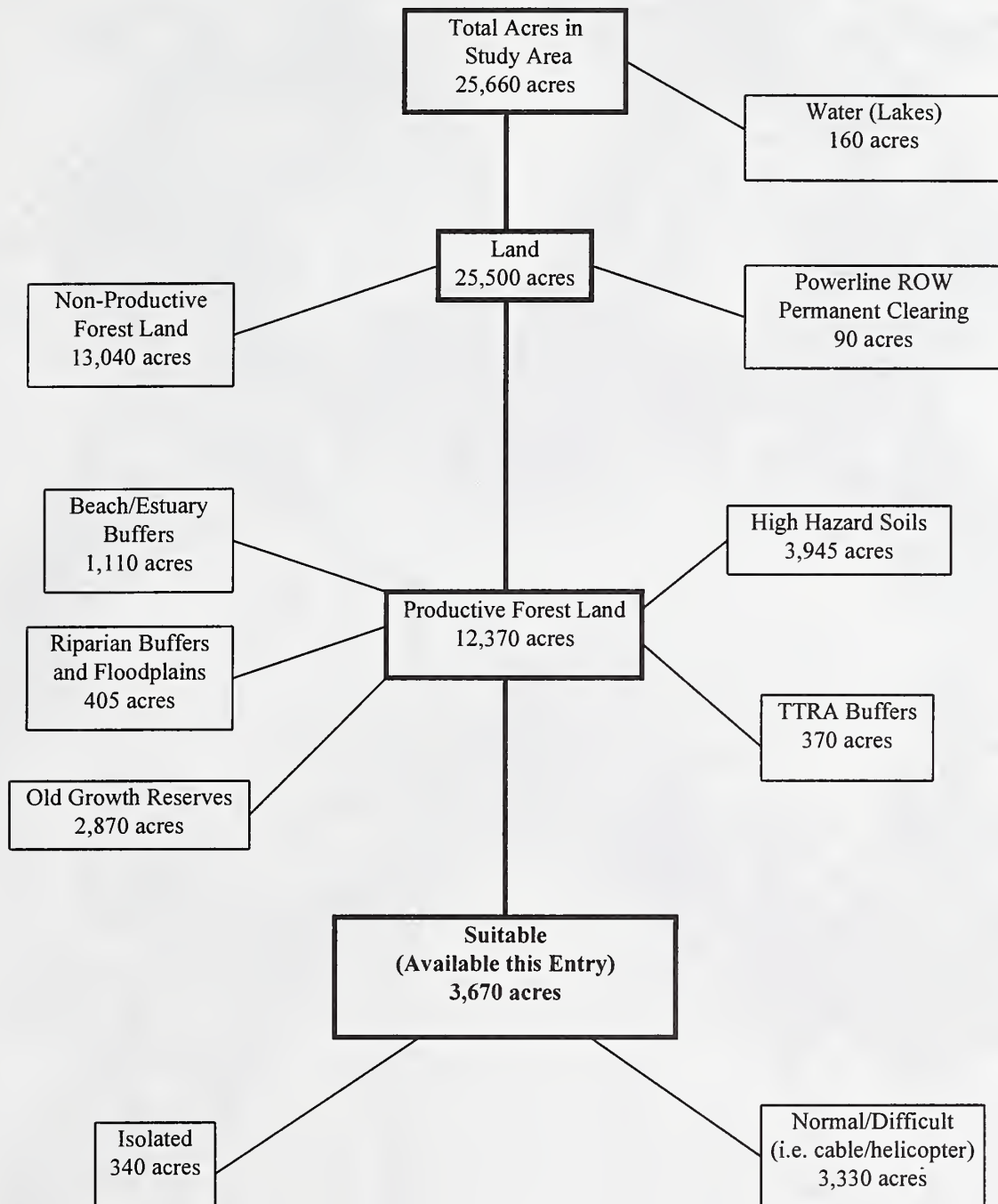
Figures 3-1 and 3-2 show the classifications of land within the project area. After various types of exclusions, there are 3,671 acres of land available for harvest. This is less than 1/3 of the total Productive Forest Land (Volume > 8,000 bf, Figure 3-3). The numbers in Figure 3-1 were derived from Geographic Information System data bases which were modified by field reconnaissance and stand exams to better reflect existing ground conditions.

There are approximately 25,658 acres within the project area of which 158 acres are water. Most of the acreage computations are based on the remaining 25,500 acres.

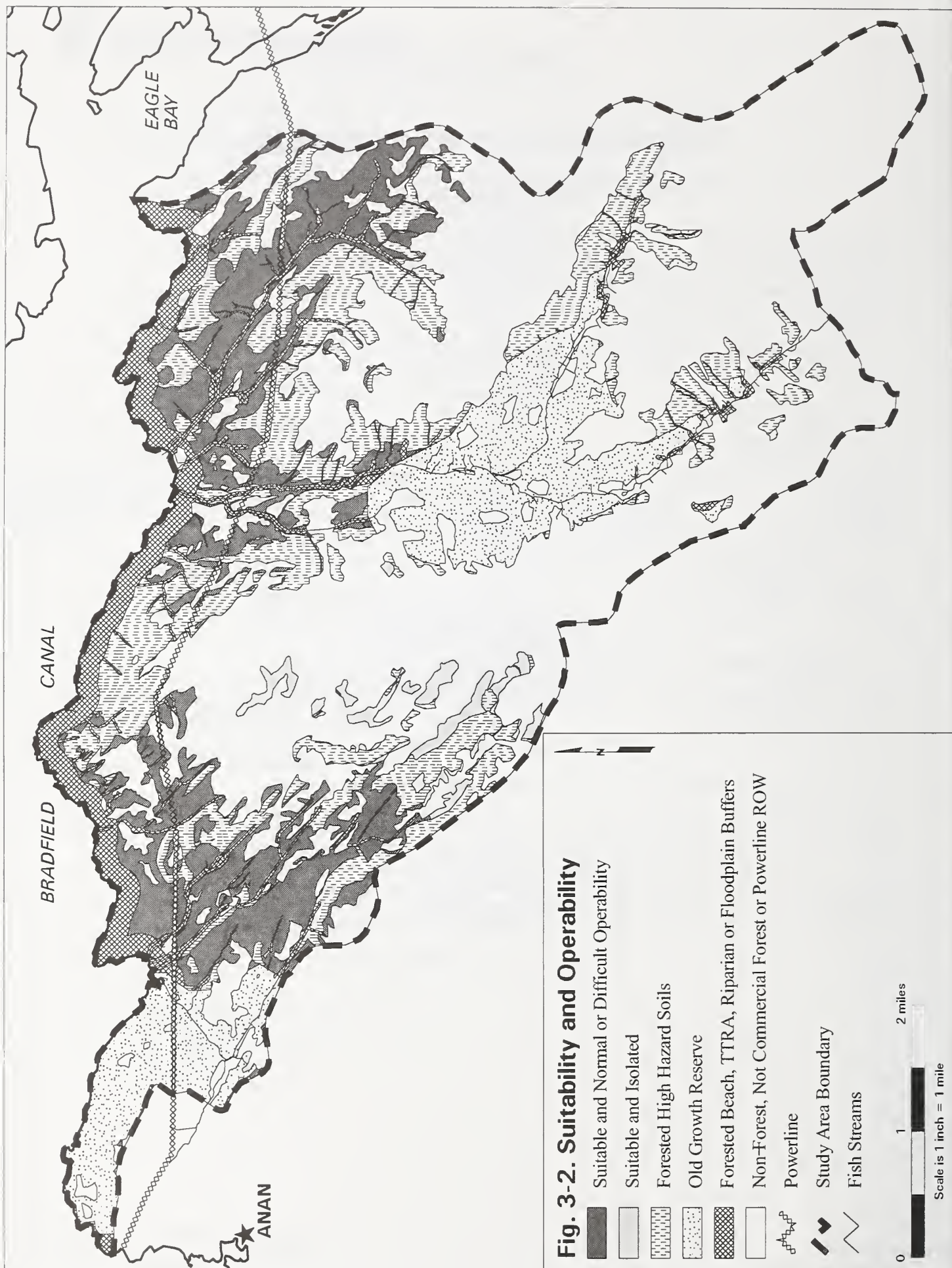
- Non-productive forest land includes areas of bare rock, alpine meadows, muskeg wetlands and soils that only support scrub timber.
- High hazard soils are areas that pose a high risk of mass failure due to steep slope, soil type, drainage ability or other factors.
- Stream and riparian buffers are required on all Class I, Class II and most Class III streams.
- Forest Plan Standards require 1000 foot beach and estuary buffers.

The suitable acres include lands that can be regenerated successfully, logged without causing irreversible soil damage, and are not withdrawn from timber production by statute or administrative action. During the planning process, some of the suitable lands were determined to have low volume or low quality timber that would make them uneconomical to harvest at this time. Potential units on those lands were eliminated from the alternatives considered for this sale, which decreased the volume available for harvest in this entry.

Figure 3-1  
Acreage Classification for the Canal Hoya Study Area











# 3 Environment and Effects

## Economics

### Employment in Southeast Alaska

The communities of Southeast Alaska depend on the Tongass National Forest to provide the foundation for one or more natural resource based industries including: wood products, commercial fishing and fish processing, tourism, mining and mineral development. Many residents also depend heavily on subsistence hunting and fishing to meet their basic needs. Government, transportation service and educational services are also significant regional income sources (Table 3-1).

Table 3-1  
**Southeast Alaska Annual Average Employment  
1994 and 1996 Forecast**

|                                 | 1994          | 1996          | Gain/Loss   |
|---------------------------------|---------------|---------------|-------------|
| <b>Goods Producing</b>          | 5,850         | 5,550         | -300        |
| Mining                          | 150           | 225           | +75         |
| Construction                    | 1,550         | 1,525         | -25         |
| Manufacturing                   | 4,150         | 3,800         | -350        |
| Seafood Processing              | (1,650)       | (1,525)       | (-125)      |
| Forest Products                 | (2,200)       | (1,950)       | (-250)      |
| <b>Service Producing</b>        | 29,400        | 30,000        | +600        |
| Transportation                  | 2,900         | 2,975         | +75         |
| Trade                           | 6,550         | 6,750         | +200        |
| Wholesale                       | (550)         | (550)         | (0)         |
| Retail                          | (6,000)       | (6,200)       | (+200)      |
| Finance, Insurance, Real Estate | 1,450         | 1,600         | +150        |
| Services and Misc.              | 6,200         | 6,575         | +375        |
| Government                      | 12,300        | 12,100        | -200        |
| Federal                         | (2,000)       | (1,950)       | (-50)       |
| State                           | (5,350)       | (5,250)       | (-100)      |
| Local                           | (4,950)       | (4,900)       | (-50)       |
| <b>TOTAL</b>                    | <b>35,250</b> | <b>35,550</b> | <b>+300</b> |

Source: *Alaska Economic Trends* (Alaska Department of Labor, May 1995)

A mixture of employment growth and decline is projected for Southeast Alaska. Gains are expected in the mining industry with the reopening of the Greens Creek mine on Admiralty Island and construction employment is expected to increase in response to a number of residential and public works projects. The number of visitors to Southeast Alaska continues to increase, which increases employment in the services and retail trade sectors. The gains in these industries are tempered by the effects of reduced logging activity and the closures of the Wrangell sawmill, and APC and KPC pulpmills. Decreasing budgets are expected to lead to job cuts in the government sector. A new individual fishing quota system and recent low prices for some species are expected to reduce seasonal processing and fishing crew positions.

The wood products industry has been an integral part of the regional economy of Southeast Alaska since the 1950's. From 1981 through 1994, the industry provided direct employment to an average of 2,704 workers, and indirect jobs for an additional 1,890 people. Recent employment in the timber industry of Southeast Alaska for 1987-1994 is listed in Table 3-2.



Table 3-2.  
**Jobs Produced in the Timber Industry Since 1987**

| Type of Jobs | 1987         | 1988         | 1989         | 1990         | 1991         | 1992         | 1993         | 1994         | Jobs/<br>MMBF |
|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|
| Logging      | 1,545        | 1,981        | 2,113        | 2,144        | 1,554        | 1,415        | 1,344        | 1,177        | 2.30          |
| Sawmill      | 375          | 468          | 478          | 500          | 604          | 538          | 447          | 515          | 1.01          |
| Pulpmill     | 861          | 892          | 925          | 899          | 911          | 910          | 859          | 533          | 1.04          |
| Direct       | 2,781        | 3,341        | 3,516        | 3,543        | 3,069        | 2,863        | 2,650        | 2,225        | 4.35          |
| Indirect     | 1,950        | 2,350        | 2,550        | 2,570        | 2,226        | 2,077        | 1,935        | 1,624        | 3.18          |
| <b>TOTAL</b> | <b>4,731</b> | <b>5,691</b> | <b>6,066</b> | <b>6,113</b> | <b>5,295</b> | <b>4,940</b> | <b>4,585</b> | <b>3,849</b> | <b>7.53</b>   |

Source: Timber Supply and Demand 1994, USDA Forest Service, March 1995

## Market Demand for Timber

Many factors affect market demand for the products produced from Tongass timber, including; installed mill capacity, regional and world timber markets, and the availability and cost of timber.

Wood product manufacturers operating in Southeast Alaska in 1994 had an installed mill capacity to process approximately 519 MMBF. Total wood consumption in 1994 was 359 MMBF which equalled 69% of the processing capability. According to the Forest Plan, in 1997 timber processors in Southeast Alaska have an installed mill capacity of 322 MMBF and are operating at 52% of their capacity.

The Forest Plan also predicts that timber demand will be lower than previous estimates primarily due to the shutdown of both the APC and KPC pulpmills. The closure of these pulpmills has drastically effected the demand for utility and low grade sawlogs which have historically been processed into pulp products. Higher grade sawlog demand has remained high despite the pulpmill shutdowns. Based on the recent Brooks and Haynes 1997 update of projected demand for Tongass timber, the Forest Plan estimates an average 10 year sawlog demand (1998-2007) of 110 MMBF per year. This demand projection is based on mills that are currently operating and assumes that they maintain their current product mix. The demand projection does not account for potential industry development and changes in products produced from utility, low grade sawlogs and sawmill residues. Currently, several Southeast Alaska companies are either developing or proposing to develop value-added processing facilities which may increase demand beyond the Forest Plan estimates.

There are essentially three sources of timber for processors in Southeast Alaska: 1) the Tongass National Forest, 2) Native-owned timberlands, and 3) State timberlands.

The State's timber program in Southeast is relatively small, with an average annual harvest of 9 MMBF over the past several years, with a high of 21 MMBF in 1994. Harvest from Native timberland peaked in 1989 at 532 MMBF, declining to 215 MMBF in 1994. Timber harvest from the Tongass reached its peak in 1990 at 461 MMBF, declining to a ten year low of 276 MMBF in 1994. Harvest on all ownerships in Southeast Alaska for 1994 was 511 MMBF. (Timber Supply and Demand 1994). Currently, in-state processing restrictions only apply to timber harvested from federal lands. Because export market prices greatly exceed those paid by local manufacturers, the majority of Private and State timber is sold overseas. Thus the bulk of the wood actually processed in Southeast Alaska comes from the Tongass National Forest.

### 3 Environment and Effects

The Canal Hoya timber sale plays an important role in the overall Tongass National Forest sale offering for fiscal year 1998 to help meet market demands for timber and retain existing employment levels, (for further information see Appendix E). The action alternatives would generate a range of 92 to 128 jobs assuming a ratio of 7.53 jobs per million board feet (4.35 direct and 3.18 indirect jobs) based on figures from Table 3-2. Typically, job duration from timber sales the size of Canal Hoya would last from 2-5 years. Market factors and operator efficiency have the largest effect on the life of the sale. Because of the variability of sale life, a comparison of total jobs produced was used rather than an estimate of jobs per year. Table 3-3 displays the employment impacts for each of the action alternatives during the entire sale life.

Table 3-3  
**Canal Hoya Contributions to Regional Employment During Sale Life  
for Each Action Alternative (number of jobs)**

| Type of Jobs               | Alt 1      | Alt 2      | Alt 3      | Alt 4     |
|----------------------------|------------|------------|------------|-----------|
| Direct (logging & milling) | 69         | 74         | 65         | 53        |
| Indirect                   | 51         | 54         | 47         | 39        |
| <b>TOTAL</b>               | <b>120</b> | <b>128</b> | <b>112</b> | <b>92</b> |

#### Market Values and Costs of Each Alternative

An economic analysis has been used to display a comparison between the four action alternatives in the Canal Hoya project area. For this analysis, the net stumpage value per MBF by alternative is calculated by subtracting all the production costs, including profit and risk allowances, from the end product selling values for lumber and pulp. The current direction in Forest Service Handbook 2409.18 recommends the use of "middle market" end product selling values in planning timber sales. By using the mid-market values instead of current values, it is easier to account for market fluctuations that can exceed \$200 per MBF. The mid-market values are the weighted average values for the past ten years, adjusted for inflation and an estimate of the timber quality on the Canal Hoya project area. All other costs used in the economic analysis were current at the time of posting the Notice of Intent for this sale.

Table 3-4 displays the resulting timber values and costs for each Canal Hoya action alternative. Alternative 5, the no action alternative, is not displayed because it has no harvest associated with it. Middle market pond value is the middle market selling value of end products (lumber and pulp) minus the manufacturing costs of these products. The volumes in each alternative include sawlog, utility and an estimate of road right of way that would be cut. The difference in net stumpage values between the action alternatives can be attributed to the following factors:

- Differences in the percentage of cable or helicopter yarding
- The amount of temporary road construction
- Differences in species composition or volume per acre harvested



Table 3-4  
**Canal Hoya Mid-Market Timber Values and Costs to an Operator of Average Efficiency for each Action Alternative**

| ECONOMIC FACTOR   | Alt 1  | Alt 2  | Alt 3  | Alt 4  |
|---|--------|--------|--------|--------|
| Total Volume (1) (mbf)  | 15,936 | 17,120 | 14,899 | 12,256 |
| Middle Market Pond Value (\$/mbf)                               | 364    | 365    | 365    | 366    |
| <b>COST (\$/MBF)</b>  |        |        |        |        |
| Stump to Truck  | 236    | 209    | 242    | 296    |
| Transportation (2)  | 37     | 39     | 36     | 33     |
| General Logging Overhead  | 26     | 26     | 26     | 26     |
| Temporary Road Cost   | 12     | 19     | 12     | 0      |
| Specified Road Cost (3)   |        |        |        |        |
| Hoya LTF Option   | 138    | 162    | 124    | 66     |
| Capsize Cove LTF Option   | 144    | 167    | 130    | 73     |
| Logging Profit and Risk (60%)                                   | 48     | 47     | 49     | 52     |
| <b>TOTAL COSTS</b>  |        |        |        |        |
| Hoya LTF Option   | 497    | 502    | 489    | 473    |
| Capsize Cove LTF Option   | 503    | 507    | 495    | 480    |
| <b>NET STUMPAGE (\$/MBF) including Specified Road Costs</b>     |        |        |        |        |
| Hoya LTF  | -133   | -137   | -124   | -107   |
| Capsize Cove LTF  | -139   | -142   | -130   | -114   |
| <b>NET STUMPAGE (\$/MBF) excluding Specified Road Costs (4)</b> |        |        |        |        |
|   | 5      | 25     | 0      | -41    |

- (1) includes road right-of-way volume
- (2) includes log haul, dump, raft, tow and road maintenance
- (3) includes major drainage structures and LTF costs
- (4) Specified road developments are considered to be a long term economic asset and therefore are not included in the net stumpage comparison between alternatives

The values in Table 3-4 are based on the weighted average for all the sellers of products produced from Tongass National Forest timber sales. The logging and manufacturing costs are also a weighted average figure that represents the costs of an operator of average efficiency. Since both values and costs are weighted averages, they are useful for comparing the economic efficiency of the action alternatives in supplying timber to the regional economy.

***Mid-Market Conditions Indicate Alternatives 1 and 2 Would Produce a Net Gain From this Sale when Specified Road and LTF Costs are Excluded.***

The mid-market analysis produced net stumpage values ranging from positive \$25 per MBF for Alternative 2 to negative \$41 per MBF for Alternative 4. A positive net stumpage value generally indicates an economically viable alternative. Alternatives with negative net stumpage values need to be sold under higher than average market conditions to produce positive advertised stumpage above base rates. The variation in net stumpage between alternatives is primarily due to differing amounts of temporary road construction and use of cable or helicopter yarding systems. Alternative 4 has the most negative mid-market net stumpage value because it relies mostly on helicopter yarding, the most expensive yarding system. Conversely, Alternative 2 utilizes a higher percentage of cable systems resulting in the lowest logging cost of the action alternatives.

Alternatives 1 and 3 fall in between the range of mid-market net stumpage values. Both of these alternatives represent a mix of temporary road construction, cable and helicopter

### 3 Environment and Effects

logging systems. The comparison between net stumpage values for the action alternatives does not include specified road and LTF costs. Since the timber sale purchaser would earn purchaser credit for specified road construction it is not considered a cost but rather a long term economic asset (FSH 2409.18, chapter 10,13.05). If Specified road cost was considered a cost of the sale, all the action alternatives would have negative net stumpage values with Alternative 2 being the most deficit and Alternative 4 the least.

Because timber markets are cyclical by nature, it is difficult to predict what future selling values are likely to do but recent market assessments in the Forest Plan indicate sufficient mill capacity and market demand for sawlogs. Recent bidding on Stikine Area timber sales has shown a strong competitive demand for stumpage that far exceeds the advertised rates, see Table 3-5. The large spread between the advertised rate and the actual bid rate on these sales indicates that current market demand conditions are favorable and timber purchasers are willing to bid up individual sales. The final Canal Hoya timber sale appraisal will include current quarter selling values, cost information and a normal profit and risk margin.

Table 3-5  
**Recent Stikine Area Timber Sale Bidding Results**

| Sale Name        | Volume (MBF) | Advertised Rate (\$/MBF) | Bid Rate (\$/MBF) |
|------------------|--------------|--------------------------|-------------------|
| Bohemia Mountain | 35,529       | \$255                    | \$315             |
| King George      | 24,790       | \$23                     | \$143             |
| Saginaw          | 24,041       | \$22                     | \$127             |
| Shamrock         | 24,280       | \$5                      | \$194             |

*Over the Long Term, the Value of the Roads and Log Transfer Facilities May Outweigh the Immediate Cost of the Sale*

The short-term economics of harvest are different than the long-term economics of a sustained harvest level and the greatest efficiency over time. Even though this project is a short-term decision, it is the first harvest entry and should be responsive to long-term needs and issues. The economic tradeoffs between alternatives of this entry must be weighed against the cost and value of the transportation system (roads, logging system and log transfer facilities) and how they affect future economic efficiency. Alternatives 4 and 2 represent different spectrums in the development of the transportation system. Alternative 4 builds the least amount of road infrastructure, has the lowest road maintenance cost and relies primarily on helicopter yarding this entry. Since Alternative 4 builds the least amount of road, it does not provide as much access for future harvest entries. On the other end of the spectrum, Alternative 2 builds most of the road infrastructure on this first entry, has the highest road maintenance cost and favors cable logging systems. This alternative accesses the highest percentage of operable acres in the project area, enabling the road costs to be amortized over multiple entries. The difference in the amount of transportation infrastructure built for this entry and the harvest system used illustrates the range of alternatives and how they respond to both short-term as well as long-term harvest economics. Table 3-6 below provides a summary of the Canal Hoya project area alternatives.

Table 3-6

**Alternative Summary for the Canal Hoya Project Area**

|                                | Alt 1  | Alt 2  | Alt 3  | Alt 4  | Alt 5 no action |
|--------------------------------|--------|--------|--------|--------|-----------------|
| <b>TIMBER HARVEST</b>          |        |        |        |        |                 |
| Manageable Acres               | 3,671  | 3,671  | 3,671  | 3,671  | 3,671           |
| Treatment Acres                | 781    | 799    | 704    | 609    | 0               |
| % of Manageable Treated        | 21%    | 22%    | 19%    | 17%    | 0               |
| <b>HARVEST VOLUME (MBF)</b>    |        |        |        |        |                 |
| Cable Volume                   | 8,150  | 11,549 | 7,014  | 1,260  | 0               |
| Helicopter Volume              | 7,286  | 4,891  | 7,485  | 10,836 | 0               |
| Total Volume (1)               | 15,436 | 16,440 | 14,499 | 12,096 | 0               |
| <b>ROAD CONSTRUCTION MILES</b> |        |        |        |        |                 |
| Specified Road (2)             | 10.1   | 14.1   | 8.8    | 2.6    | 0               |
| Temporary Road                 | 1.6    | 2.8    | 1.6    | 0      | 0               |
| Total Road Miles               | 11.7   | 16.9   | 10.4   | 2.6    | 0               |

(1) Road Right-Of-Way volume not included

(2) Miles based on Hoya LTF option



## 3 Environment and Effects

### Issue Two: Scenic and Tourism Values

People are concerned about how this sale would change the scenic conditions, and recreation/tourism potential in the Bradfield Canal. The majority of use currently is by recreationists who are accompanied by guides, whether they are fishing, big game hunting, or sightseeing (particularly those users boating to Anan Wildlife Observatory with guides from Wrangell). The visual condition of the landscape is the main recreational attribute this project area provides to users. Actual recreation use of the project area is low. The majority of use consists of guided fishing and guided big game hunting.

We have split this issue into 3 major discussion areas:

- Scenery
- Post Sale Road Management Strategies and Recreation Potential
- Direct Effects to Recreationists, Tourists, and Outfitter/Guides

#### Scenery

The Canal Hoya Project Area is located on the south shore of the mouth of the Bradfield Canal. Currently, the landscape seen in the project area is undeveloped, except for the powerline passing through the area. The area is viewed by boaters using the Bradfield Canal and Eastern Passage. The entire shoreline of the project area is located along the Bradfield Canal and is viewed for long periods of time by boaters travelling the Bradfield Canal and by recreationists using the area. The western shore of the project area is viewed at oblique angles for short periods of time by boaters travelling the Eastern Passage.

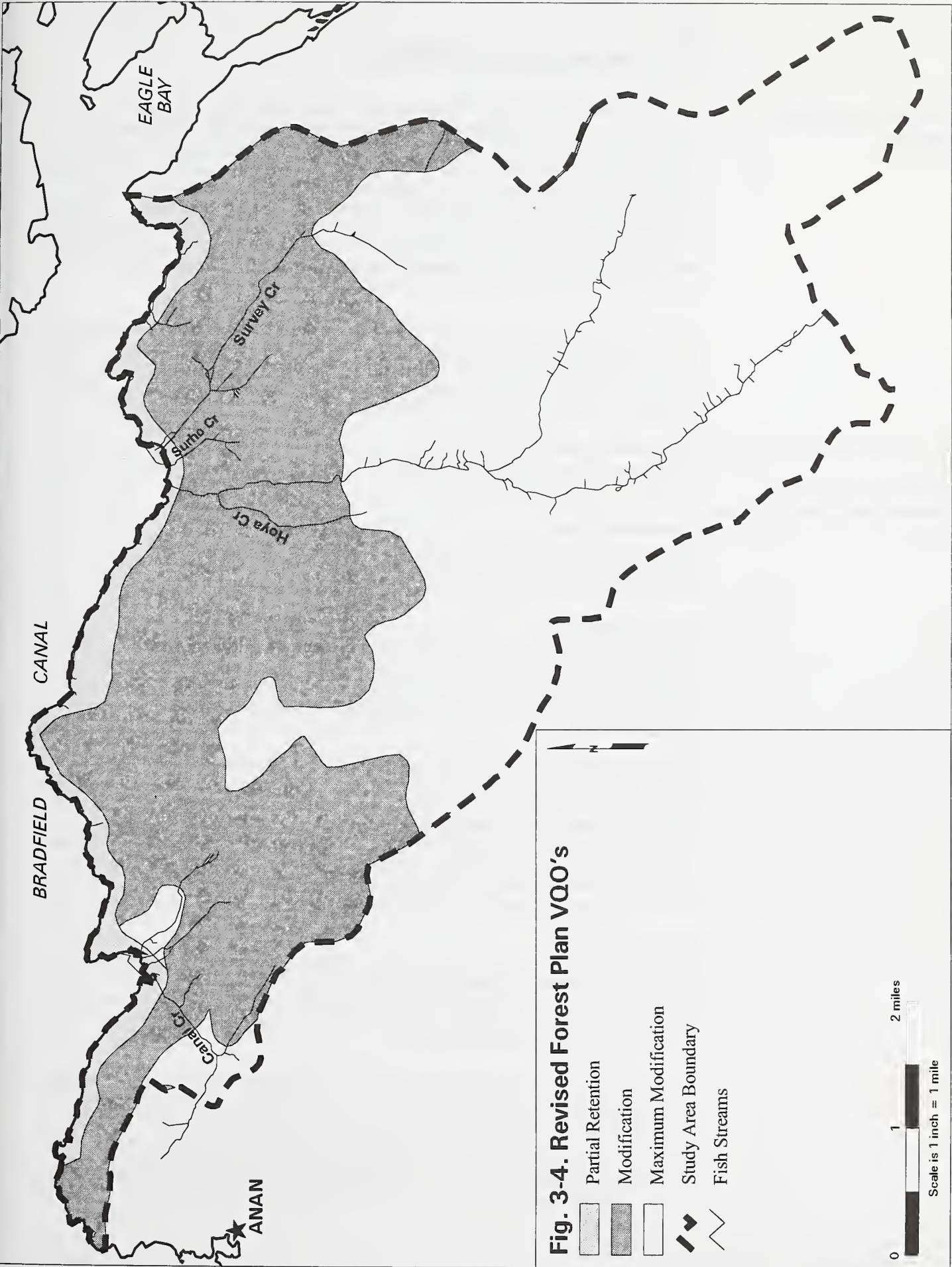
The Canal Hoya Project Area is in the "Modified Landscape" and "Timber Production" Management Prescriptions in the Forest Plan (Figure 1-2). Appendix F of the Forest Plan (Visual Priority Routes & Use Areas) lists the Eastern Passage under "Alaska Marine Highway & Tour Ship Routes", and the Bradfield Canal under "Other Travel Routes" in its list of Priority Routes.

For those areas designated as Timber Production, direction in the Forest Plan calls for application of the Modification Visual Quality Objective (VQO) in foreground distance zone of Visual Priority Routes and Use Areas, and the Maximum Modification VQO in all other areas. All lands designated as Timber Production in the Canal Hoya Project Area are unseen.

For those areas designated as Modified Landscape, direction in the Forest Plan calls for application of the VQO of Partial Retention in foreground distance zones, and Modification in middleground and background distance zones, as seen from Visual Priority Travel Routes and Use Areas. The Maximum Modification VQO should be applied in all other areas of this Land Unit Designation. All seen acres in the Canal Hoya Project Area are designated as Modified Landscape. The entire foreground distance zone, as seen from the Bradfield Canal travel route, is within the 1,000 foot beach buffer. The only proposed developments in the foreground distance zone called for in this project are the Canal and Hoya Log Transfer Facilities (LTF's).

Almost all of the proposed harvest units for the Canal Hoya Timber Sale are in Modified Landscape Management Prescription area. Therefore, all proposed harvest activities for the Canal Hoya Timber Sale should meet or exceed the Modification VQO.





**Fig. 3-4. Revised Forest Plan VQO's**

# 3 Environment and Effects

## Visual Management Classes

In order to determine what kind of harvest activities are compatible in the project area, we have split the area into Management Class. The Management Classes are determined by identifying an area's Visual Quality Objective (VQO) while taking into consideration the Visual Absorption Capability (VAC) of the area. VQO's are expressed in terms of describing the objective for the landscape (i.e. : "Preservation", "Retention", "Partial Retention", "Modification", "Maximum Modification", "Rehabilitation", or "Enhancement"). VQO's for particular areas on the Tongass National Forest are determined in the Forest Plan, depending on the area's Management Prescription and the presence or absence of Visual Priority Routes and Use Areas. The only VQO's present in the Canal Hoya Project Area are Partial Retention, Modification, and Maximum Modification (Figure 3-4).

An area's Visual Absorption Capability (VAC) is determined by the general complexity of the landscape, the slope, and the distance from which a person would view an area. VAC is expressed in terms of "High", "Intermediate" and "Low". All three VAC's are present in the Canal Hoya Project Area. The Region 10 Landscape Management Handbook was used to designate Visual Management Classes for the Canal Hoya Project Area (Figure 3-5).

*There are five Visual Management Classes described in the Region 10 Landscape Management Handbook:*

### Management Class P (Preservation)

Management Class P areas are those areas with a VQO of Preservation. This VQO is not present in the Canal Hoya Project Area.

### Management Class 1

Management Class 1 areas include those areas with a VQO of Retention and Low or Intermediate VAC, or areas with a VQO of Partial Retention and Low VAC. This Management Class is not present in the Canal Hoya Project Area.

### Management Class 2

Management Class 2 areas include those areas with Retention VQO and High VAC, Partial Retention VQO and Intermediate VAC, or Modification VQO and Low VAC. There are 5,689 acres of Management Class 2 in the Project Area. The Canal VCU (5210) contains 2,450 acres of Management Class 2, and the Hoya VCU (5200) includes 3,239 acres of Management Class 2.

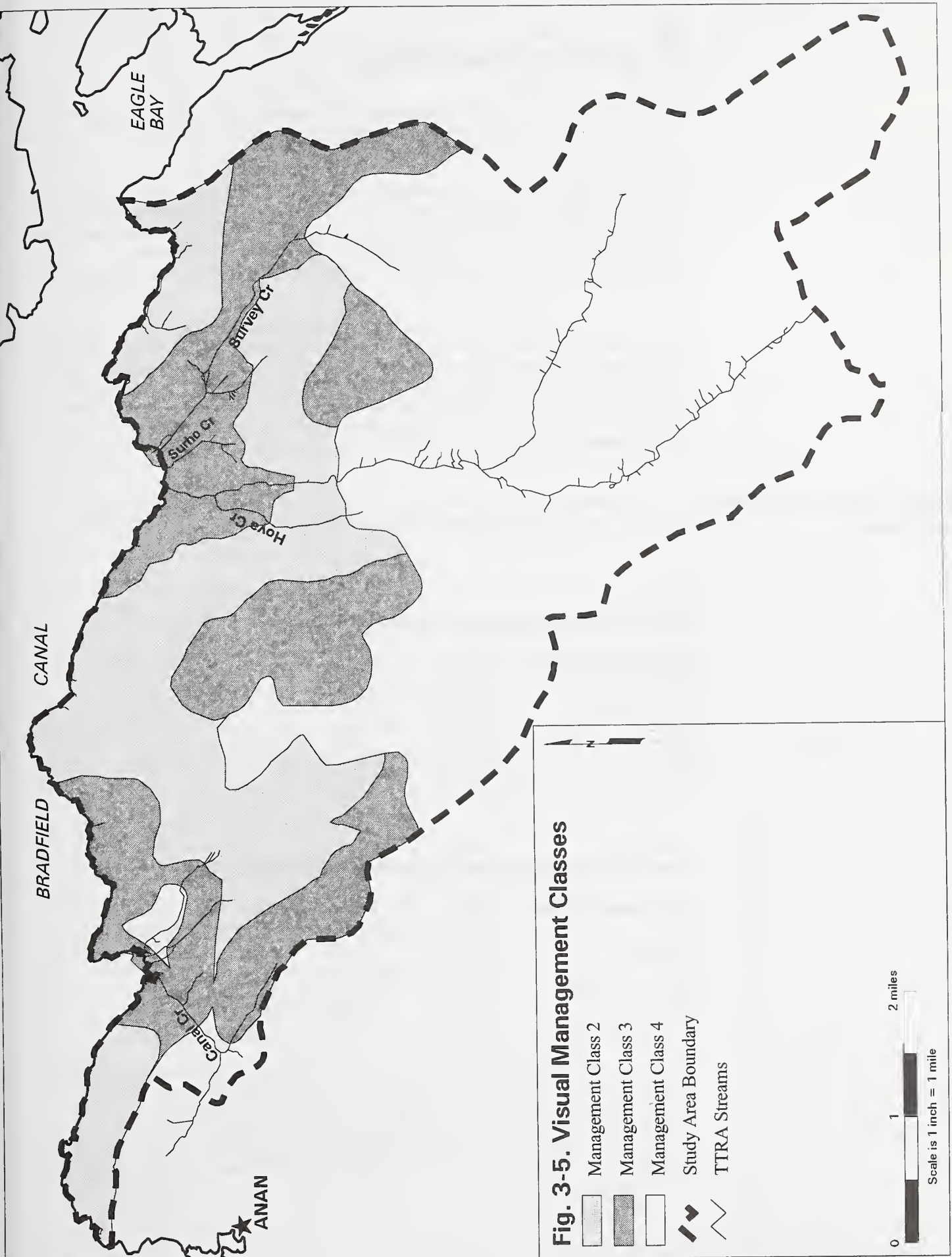
All partial cutting harvest methods are compatible in this management class. Clearcutting should remain visually subordinate to the existing landscape character. The landscape variety plays a key role in how much and what type of harvest can occur while meeting the objectives of the management class. Generally, the more complex the landscape, the more harvest that landscape can absorb. General guidelines for Management Class 2 include: clearcuts should not exceed 15 acres, "fuzzy" clearcuts with some retention can approach 40 acres in size depending on the landscape, harvest units with 20-40% retention can range from 15-55 acres depending on landscape, and the overall cumulative visual disturbance can not exceed 15%.

### Management Class 3

Management Class 3 areas include those areas with Partial Retention VQO and High VAC, Modification VQO and Intermediate VAC, or Maximum Modification VQO and Low VAC. There are 6,107 acres of Management Class 3 areas in the Canal Hoya Project Area. The Canal VCU (5210) contains 2,643 acres of Management Class 3, and the Hoya VCU (5200) includes 3,464 acres of Management Class 3.

All partial cutting harvest methods are compatible with this management class. Clearcutting and associated roadbuilding may be visually evident in this management class, but units and roadbeds should be designed to borrow from the existing landscape to the extent that they appear to be natural occurrences to the untrained eye. Landscape complexity will dictate how much and what type of harvest can occur and still meet the objectives of the management class. General guidelines for Management Class 3 areas include: clearcuts should not exceed 40 acres, "fuzzy" clearcuts with some retention can approach 60 acres depending on the





### 3 Environment and Effects

landscape, harvest units with 20-40% retention can range from 55-75 acres depending on the landscape, and the overall cumulative disturbance can not exceed 20%.

#### Management Class 4

Management Class 4 areas include those areas with Modification VQO and High VAC, or Maximum Modification VQO and Intermediate or High VAC. There are 13,818 acres of Management Class 4 in the Canal Hoya Project Area. The Canal VCU (5210) contains 2,541 acres of Management Class 4, and the Hoya VCU (5200) includes 11,277 acres of Management Class 4. All Management Class 4 acres in the Canal Hoya Project Area are inventoried as "unseen" from the water.

All normal timber management activities are acceptable in this management class. Harvest activities should be natural appearing when viewed in the background, and should borrow from the natural landscape as much as is practical. General guidelines for Management Class 4 areas include: clearcuts should not exceed 60 acres when visible, "fuzzy" clearcuts with some retention can approach 80-100 acres depending on the landscape, harvest units with 20-40% retention may exceed 100 acres depending on landscape, and the overall cumulative visual disturbance can not exceed 50%. Areas with Modification VQO should not exceed 25% overall visual disturbance.

#### Effects of the Alternatives on Scenery

All action alternatives would result in a change in the visual conditions of the landscape. Tables 3-7 and 3-8 list the number of acres each alternative proposes to harvest in the different Management Classes.

Table 3-7  
**Canal VCU: Acres Harvested in Each Visual Management Class**

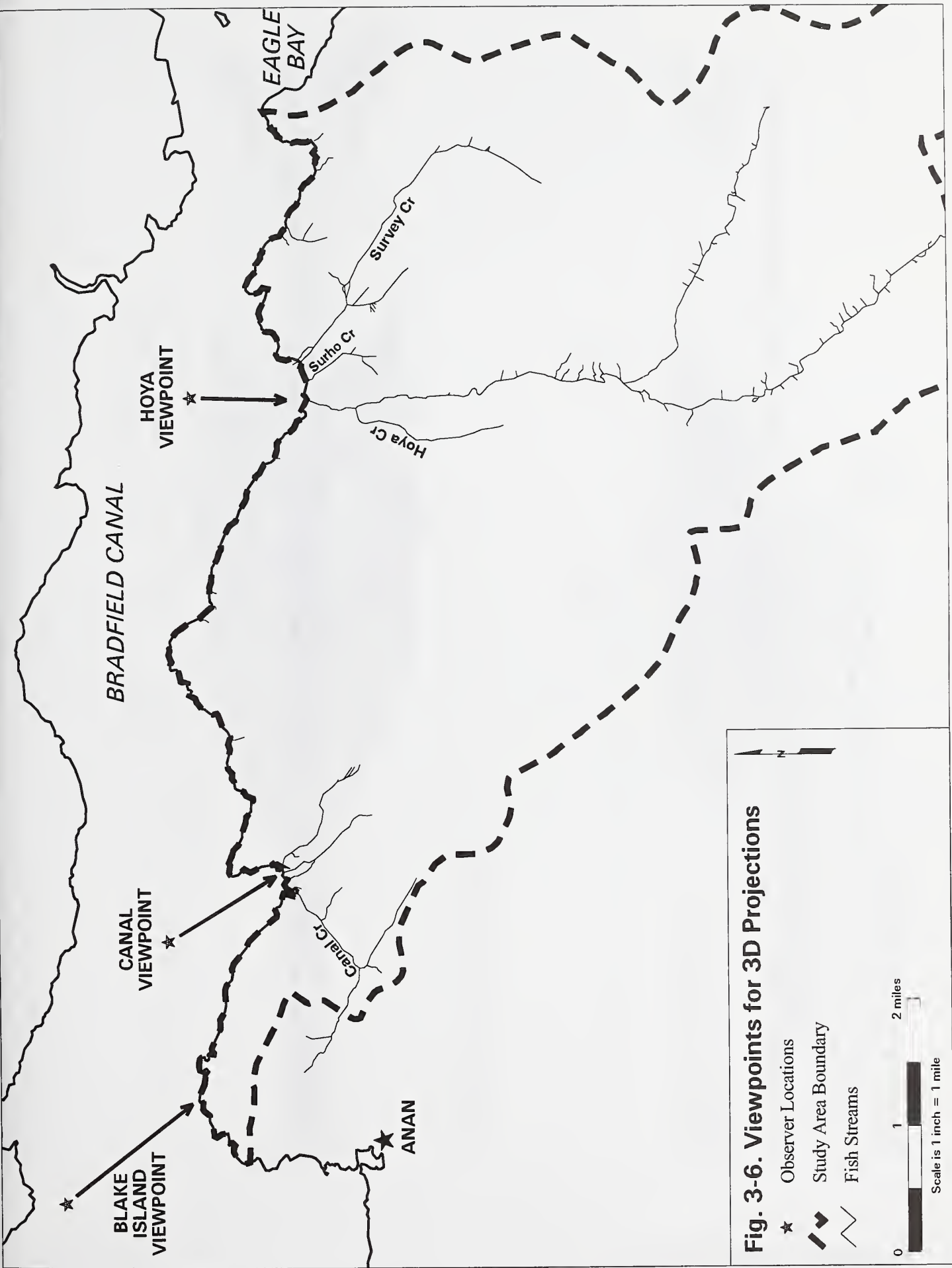
| Management Class          | Alt 1               | Alt 2                | Alt 3              | Alt 4              |
|---------------------------|---------------------|----------------------|--------------------|--------------------|
| MC 2<br>(2,450 ac. total) | 79 Acres<br>(3.2 %) | 177 Acres<br>(7.2 %) | 41 Acres<br>(1.6%) | 49 Acres<br>(2.0%) |
| MC 3<br>(2,643 ac. total) | 93 Acres<br>(3.5%)  | 79 Acres<br>(2.9%)   | 68 Acres<br>(2.5%) | 71 Acres<br>(2.6%) |
| MC 4<br>(2,541 ac. total) | 60 Acres<br>(2.3%)  | 37 Acres<br>(1.4%)   | 31 Acres<br>(1.2%) | 0 Acres            |

Table 3-8  
**Hoya VCU: Acres Harvested in Each Visual Management Class**

| Management Class           | Alt 1               | Alt 2               | Alt 3               | Alt 4               |
|----------------------------|---------------------|---------------------|---------------------|---------------------|
| MC 2<br>(3,239 ac. total)  | 225 Acres<br>(6.9%) | 169 Acres<br>(5.2%) | 203 Acres<br>(6.2%) | 140 Acres<br>(4.3%) |
| MC 3<br>(3,464 ac. total)  | 274 Acres<br>(7.9%) | 222 Acres<br>(6.4%) | 244 Acres<br>(7.0%) | 275 Acres<br>(7.9%) |
| MC 4<br>(11,277 ac. total) | 50 Acres<br>(<1%)   | 116 Acres<br>(1.0%) | 116 Acres<br>(1.0%) | 74 Acres<br>(<1%)   |

Perhaps the best way to display the effects of proposed harvest on the scenic condition of the project area is to include pictures of what we expect the area would look like after harvest. We have picked three viewpoints to include in this analysis (Figure 3-6): 1) a view from Blake Island, 2) a view from the mouth of Canal Creek, and 3) a view from the mouth of Hoya Creek. We use computer generated 3-D views to help determine what the area is likely to look like after harvest. These pictures display the differences between the alternatives from each viewpoint.





### **Blake Island Viewpoint (Viewpoint 1)**

The Blake Island viewpoint is looking towards the project area as seen from the Eastern Passage (Figure 3-7). This view is important to people travelling the Eastern Passage by boat of ferry. Of particular interest is the view for the many recreationists boating to Anan from Wrangell. Although none of the proposed harvest would be visible from the Anan Wildlife Observatory, many visitors would view the effects of harvest (Figures 3-8 through 3-11) on their way to and from Anan.

Figure 3-7

### **Viewpoint 1, Blake Island View**

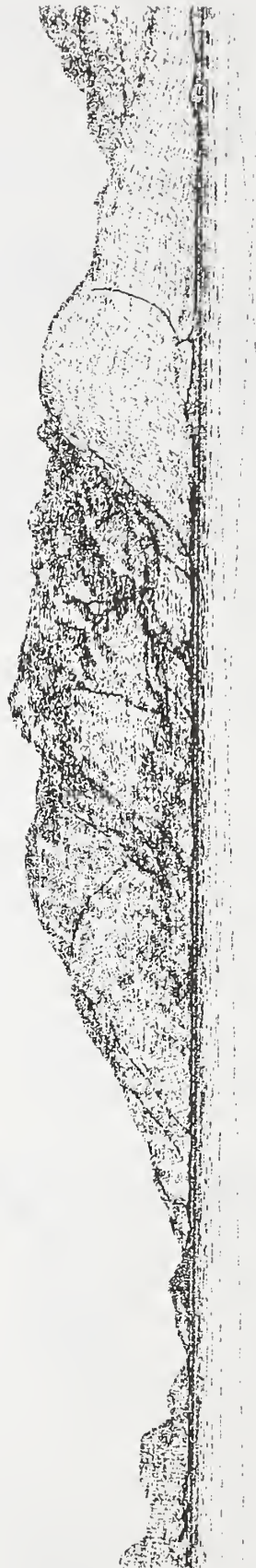


Figure 3-8  
Blake Island Viewpoint, Alternative 1

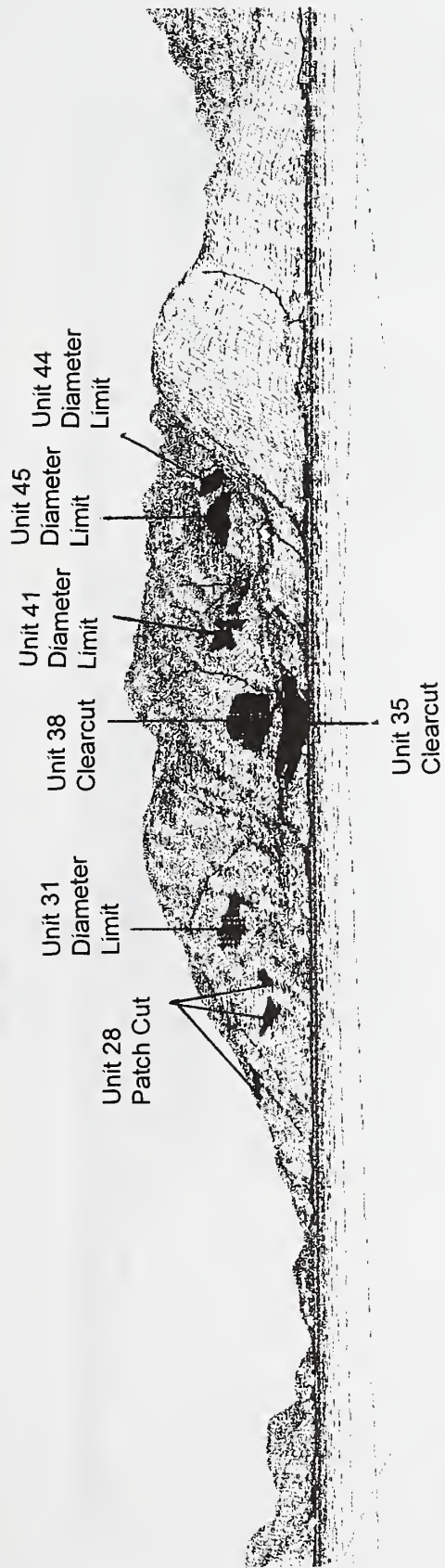


Figure 3-9  
Blake Island Viewpoint, Alternative 2

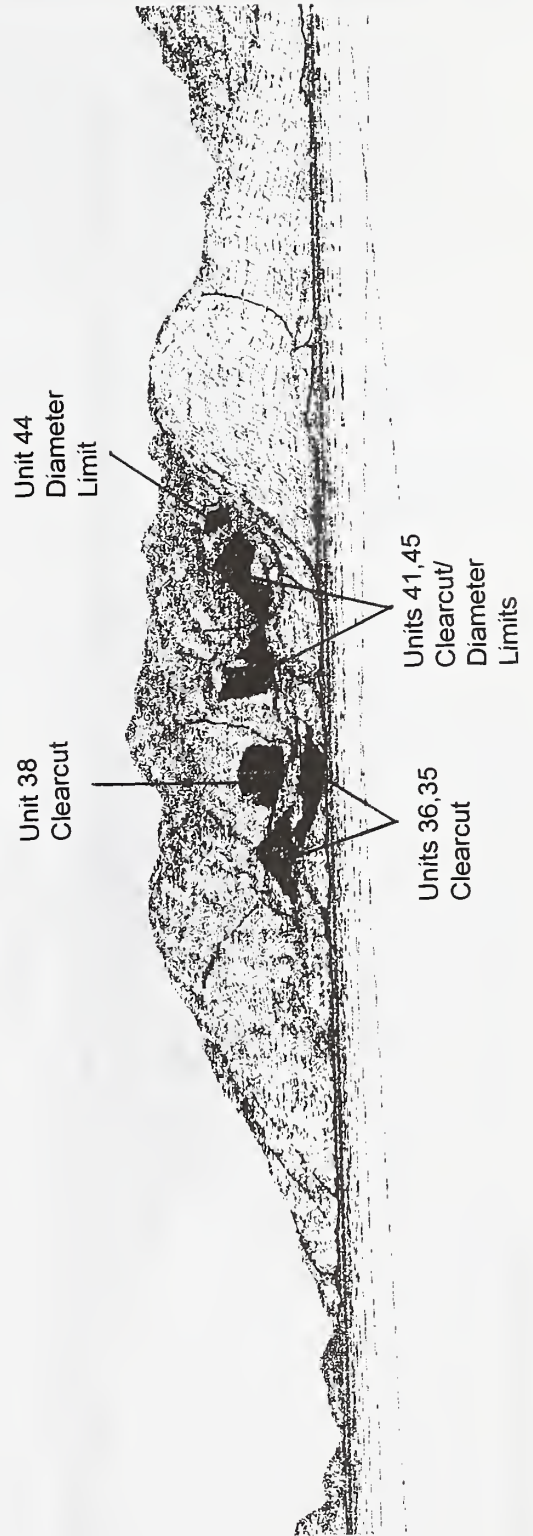




Figure 3-10  
Blake Island Viewpoint, Alternative 3

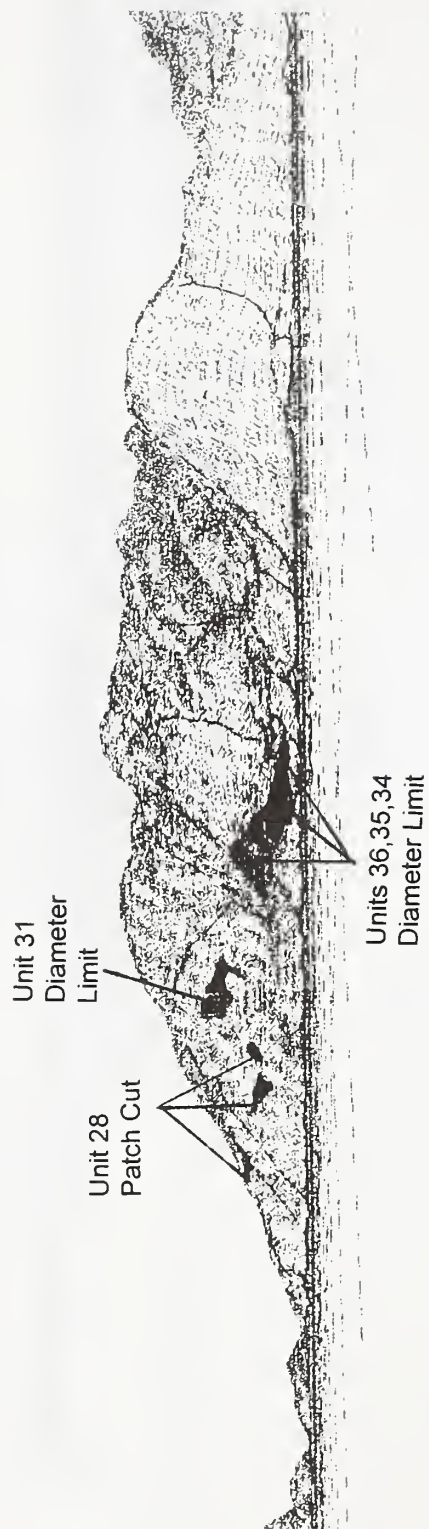
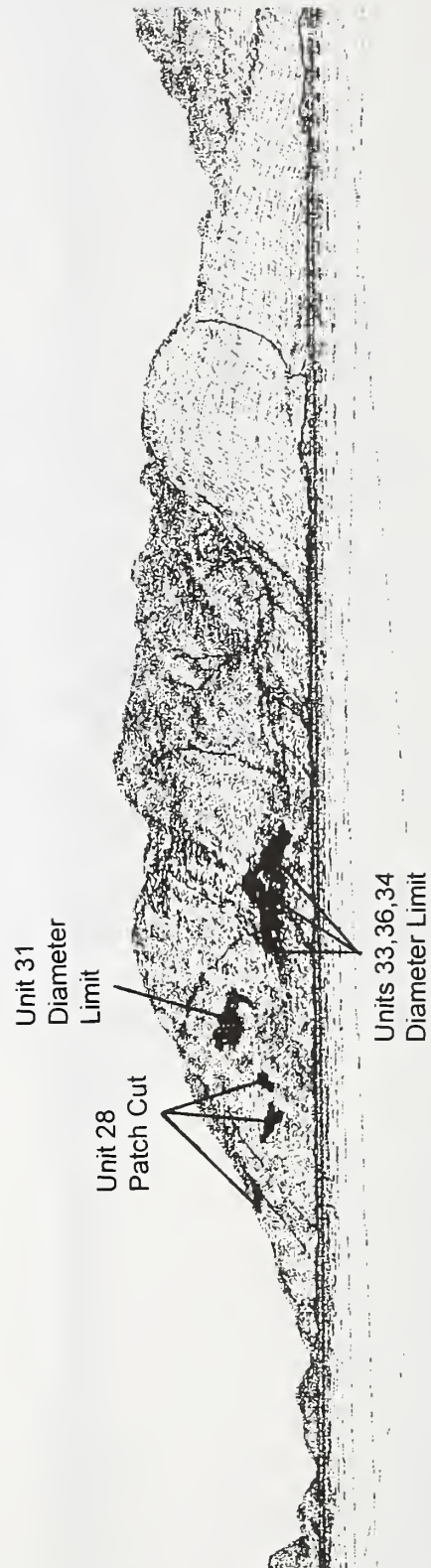


Figure 3-11  
Blake Island Viewpoint, Alternative 4





### **Effects of Alternatives From the Blake Island Viewpoint**

Any proposed harvest would be visible to some degree from the Blake Island Viewpoint. Alternative 1 (Figure 3-8) and Alternative 2 (Figure 3-9) would have similar visual effects because of the proposed road and associated cable yarding of harvest units. Alternative 1 would have more openings because of the helicopter units proposed (the patches proposed in Unit 28, and the diameter limit harvest in Unit 31), but they would blend well into the landscape and may not be noticeable to the casual observer. The cable units proposed in both alternatives would be noticeable, with Alternative 2 having the most visual impact of all the alternatives proposed. Both alternatives would meet the Modification VQO from this viewpoint.

Alternative 3 (Figure 3-10) and Alternative 4 (Figure 3-11) would have similar visual effects because they both propose helicopter logging. Both alternatives would have less visual impact than Alternatives 1 or 2. Although Alternative 4 proposes slightly more acres harvested than Alternative 3, it would have the least visual impact because Alternative 3 proposes larger openings closer to shore (particularly Unit 35). Both alternatives would likely exceed the Modification VQO from this viewpoint, and may even meet Partial Retention.

### **Canal Viewpoint (Viewpoint 2)**

The Canal Viewpoint (Figure 3-12) is located mid-channel in the Bradfield Canal, looking up the Canal Creek drainage.

Figure 3-12  
**Canal Viewpoint**



Figure 3-13

Canal Viewpoint, Alternative 1

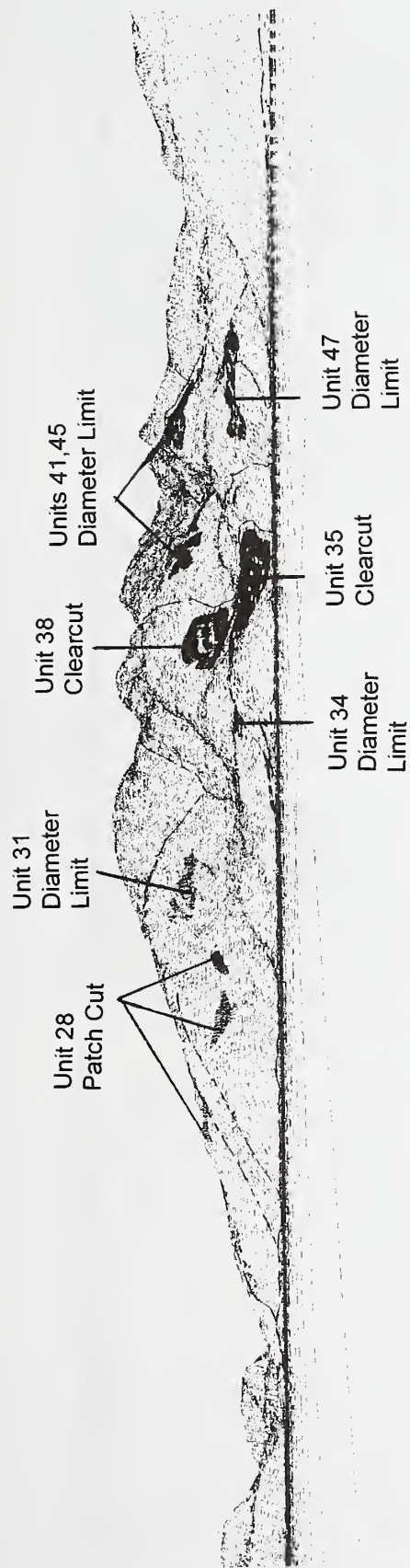


Figure 3-14

Canal Viewpoint, Alternative 2

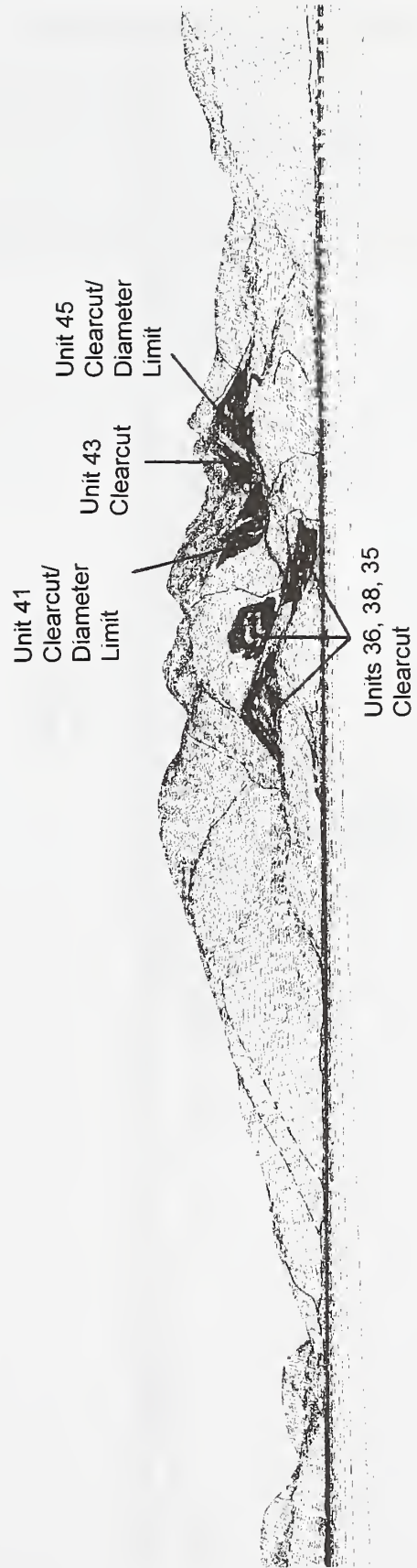


Figure 3-15  
Canal Viewpoint, Alternative 3

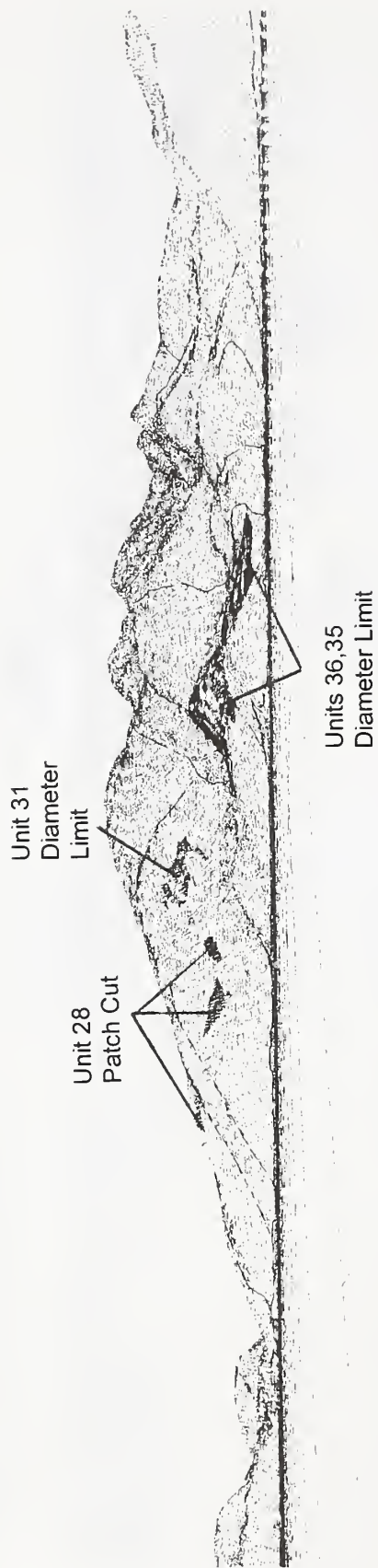
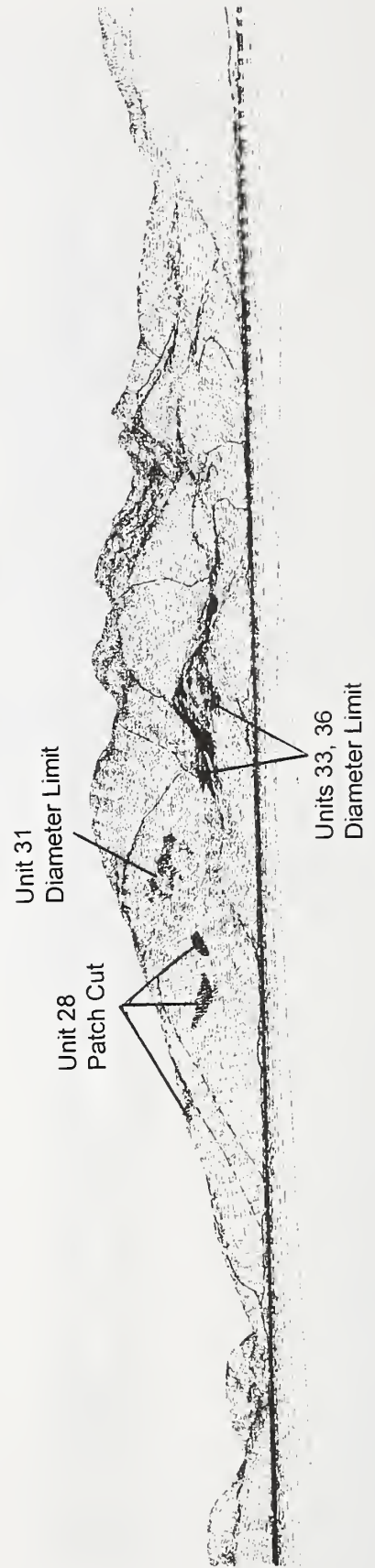


Figure 3-16  
Canal Viewpoint, Alternative 4





### **Effects of Alternatives From the Canal Viewpoint**

From the Canal Viewpoint, Alternative 1 (Figure 3-13) and Alternative 2 (Figure 3-14) would have similar visual effects because the LTF and associated road would be evident to the casual observer. Alternative 2 would have the most visual impact because most of the visible harvest would be cable logged with lower amounts of retention proposed than in Alternative 1. Alternative 1 would produce more openings than Alternative 2, but much of the proposed harvest would be helicopter yarded with higher retention left in the units, making them less evident to a casual observer. Both alternatives would meet the Modification VQO from this viewpoint.

Alternative 3 (Figure 3-15) and Alternative 4 (Figure 3-16) would have similar visual effects because both propose helicopter yarding with retention in the proposed units. Both of these alternatives may not even be evident to the casual observer. Alternative 3 would have a slightly higher visual impact than Alternative 4 because of the proposed harvest of Unit 35, which is a larger opening and is closer to shore than the units proposed in Alternative 3. Both alternatives would meet or exceed the Modification VQO from this viewpoint, and may even approach Partial Retention.

### **Hoya Viewpoint (Viewpoint 3)**

The Hoya Viewpoint (Figure 3-17) is located mid-channel in the Bradfield Canal, looking up the Hoya Creek drainage

Figure 3-17

### **Hoya Viewpoint**



Figure 3-18  
Hoya Viewpoint, Alternative 1

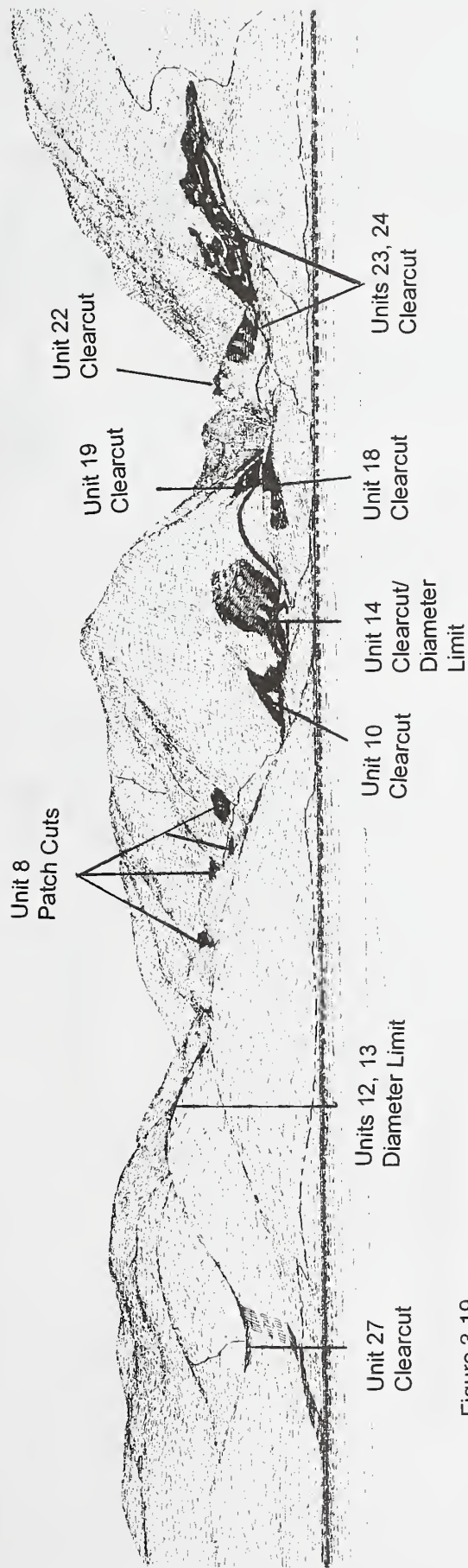


Figure 3-19  
Hoya Viewpoint, Alternative 2

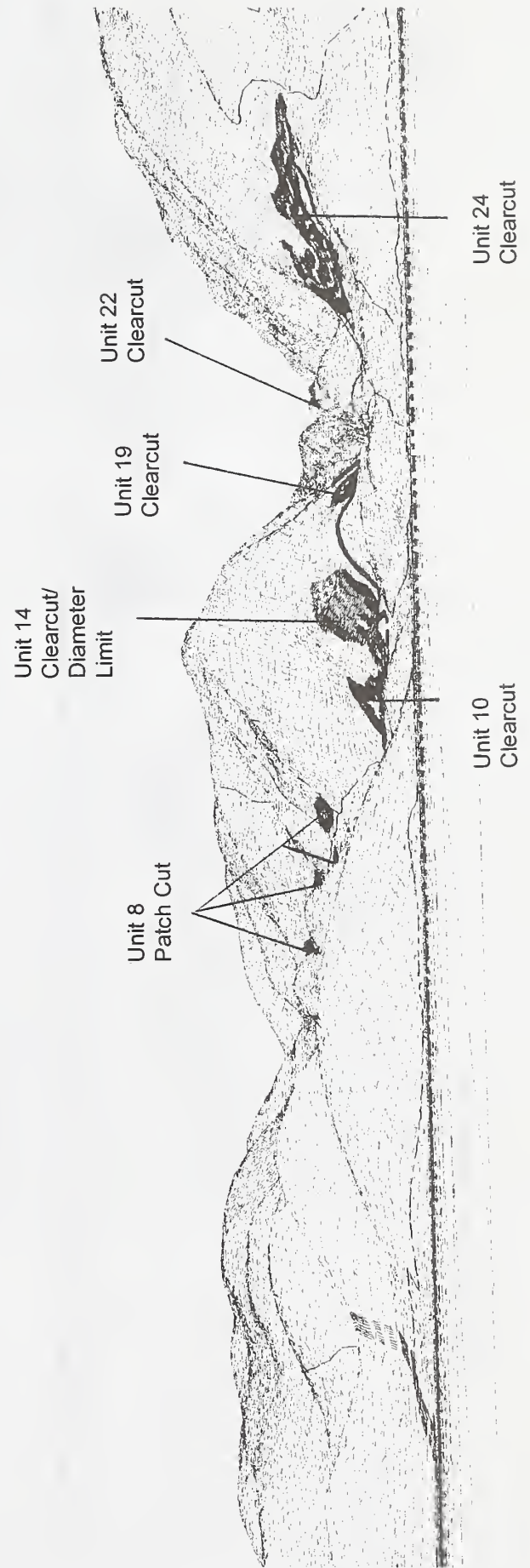




Figure 3-20  
Hoya Viewpoint, Alternative 3

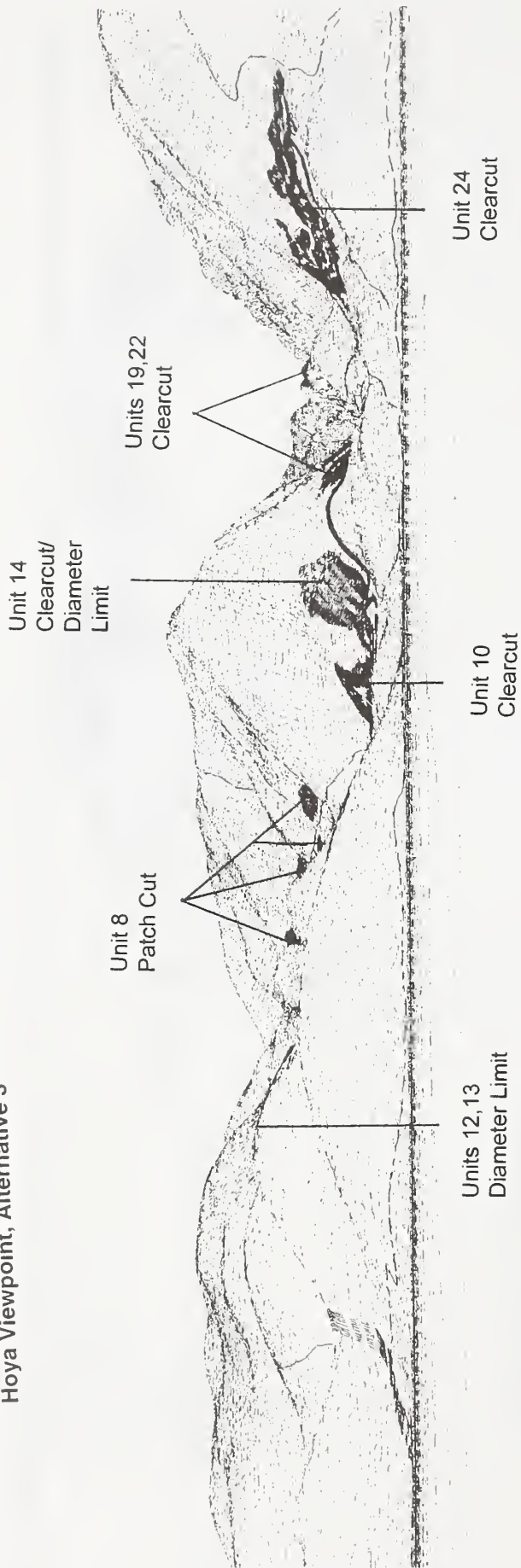
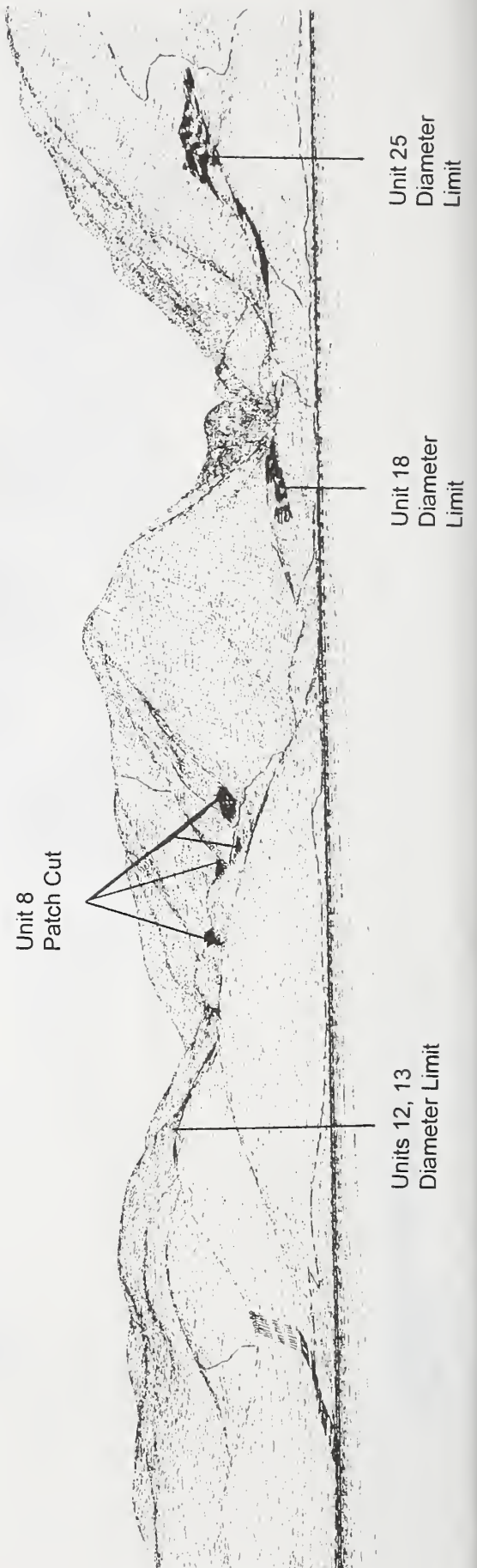


Figure 3-21  
Hoya Viewpoint, Alternative 4





## Effects of Alternatives From the Hoya Viewpoint

From the Hoya Viewpoint, Alternative 1 (Figure 3-18) would have the most visual impact of all the alternatives proposed. Although Alternative 1 proposes less road than Alternatives 2 or 3 (8.4 miles in Alternative 1 vs. 8.9 miles in Alternatives 2 and 3), the roading is concentrated closer to shore, and would be more visible, especially with the short spur road leading to Unit 18. Alternative 1 would meet the Modification VQO.

The effects of Alternative 2 (Figure 3-19) and Alternative 3 (Figure 3-20) from this viewpoint are similar because they propose identical road systems with identical cable units associated with those road systems. Alternative 3 would have a slightly higher visual impact because of the proposed helicopter harvest of Units 1, 12, and 13. Both alternatives would meet the Modification VQO.

Alternative 4 (Figure 3-21) would have the least impact of the alternatives, because it proposes fewer road miles (2.6 miles) with less cable harvest. There are several helicopter units proposed which would be visible (Units 1, 2, 12, 13, 18, and 25) but they would be harvested with a diameter limit prescription and would blend well into the landscape. Although Alternative 4 may not meet the Partial Retention VQO from this viewpoint, it would exceed the Modification VQO.

## Log Transfer Facilities

All action alternatives propose the construction of a Log Transfer Facility (LTF) accessing a road system in the Hoya VCU. Alternative 1 and Alternative 2 propose a LTF to access a road system in the Canal VCU. Both proposed LTF's would be located in the foreground distance zone as seen from the Bradfield Canal, which is listed as a Visual Priority Travel Route in Appendix F of the Forest Plan. This area is in the Modified Landscape Management Prescription, which calls for a VQO of Partial Retention. However, the Forest Plan makes some provisions for the construction of LTF's in this Management Prescription, stating "Exceptions for small areas of non-conforming developments, such as recreation sites, transportation developments, Log Transfer Facilities, and mining development, may be considered on a case-by-case basis." Plan direction also states "To meet the VQO, give special consideration to minimizing apparent landform modification (as seen from sensitive travel routes) during road and Log Transfer Facility location, design, and construction". Both LTF's are designed with the intent to minimize the impact to the visual resource as much as possible. Working areas would be buffered by beach timber, as much as possible, and openings for rock pits would be designed to minimize visual impact. Alternative 3 and Alternative 4 would have the least visual impact, as they only propose LTF construction in the Hoya VCU. Alternative 1 and Alternative 2 would have the most visual impact, as they propose a second LTF in the Canal VCU. We've included schematic sketches of the proposed LTF's to display how they would look from the water (Figures 3-22 and 3-23). Please refer to Appendix D "LTF Site Selection, Design, and Marine Effects", for a more detailed discussion of the LTF construction guidelines.

### 3 Environment and Effects

Figure 3-22  
Schematic Drawing of Canal Log Transfer Facility

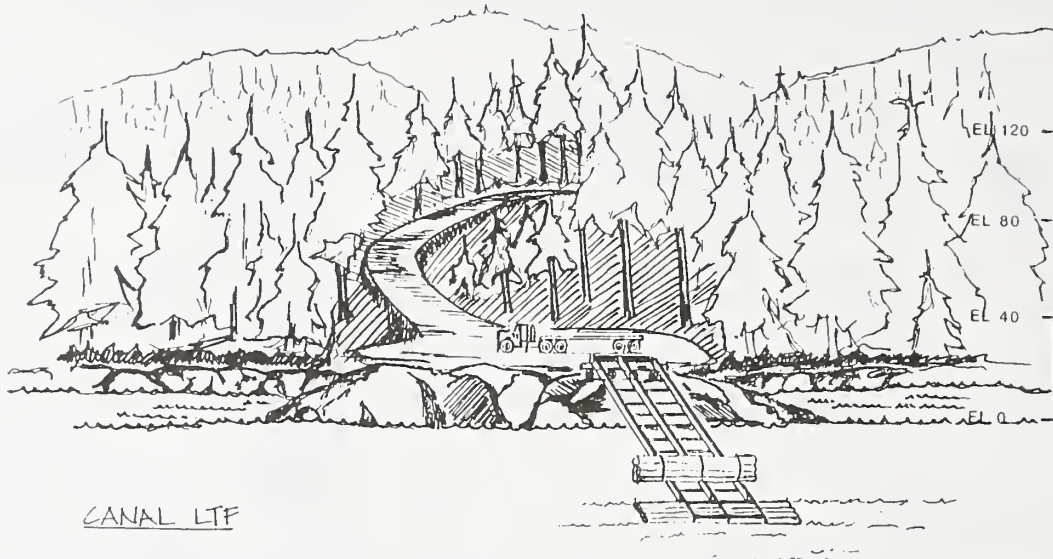
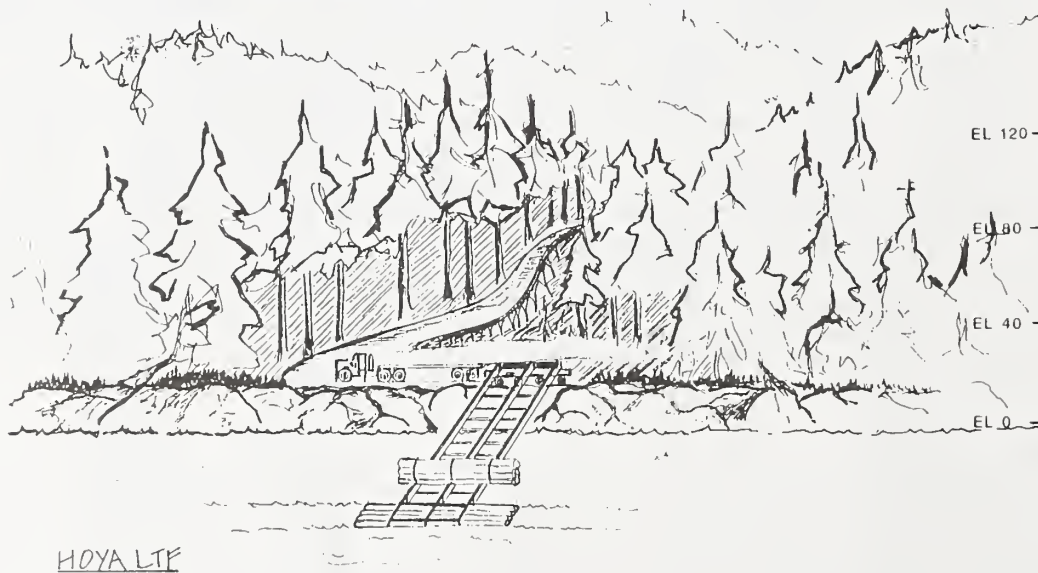


Figure 3-23  
Schematic Drawing of Hoya Log Transfer Facility



## Post Sale Road Management and Recreation Potential

The Canal Hoya Project Area is currently unroaded. Recreation use is generally restricted to beach use and some use of the streams for fishing and hunting. The area is fairly inaccessible, with a high potential for semi-primitive recreation experiences. The current recreation use level is very low, with many visitors accompanied by guides.

The major change proposed with any of the action alternatives is the introduction of roads into a previously unroaded area (Table 3-9). In all action alternatives, the roads would be closed to motorized vehicles after the sale is completed. The area is fairly remote from any town, so it is not anticipated that the roads would result in a significantly higher amount of recreation use in the area. It is not likely that this area would become a "destination recreation area" because it is not located near a population center, and there are similar recreation opportunities located much closer to Wrangell. The most potential for use would be in those alternatives that propose a road system in the Canal VCU (Alternative 1 and Alternative 2). This may attract use from the boaters travelling the Eastern Passage. The presence of an LTF may attract recreationists visiting Anan as a camping area, especially since the area immediately surrounding the Anan Wildlife Observatory is closed to camping. The potential would exist for guides already hosting visitors at Anan to utilize this area in conjunction with trips to Anan, but it is unknown if this would actually happen.

Table 3-9  
**Miles of Road in Each Alternative**

|                  | Alt 1 | Alt 2 | Alt 3 | Alt 4 |
|------------------|-------|-------|-------|-------|
| <b>Canal VCU</b> | 1.7   | 5.3   | 0     | 0     |
| <b>Hoya VCU</b>  | 8.4   | 8.8   | 8.8   | 2.6   |
| <b>Total</b>     | 10.1  | 14.1  | 8.8   | 2.6   |

### *Roads May Attract Some Users and Displace Others*

The introduction of roads would change the recreation character of this area permanently. Roads would serve to attract those users who seek somewhat developed recreation. Because of the proposed closure to motorized vehicles, the area would not attract motorized recreation use. Although the roads would be closed, they would provide for nonmotorized forms of recreation including; hunting, mountain biking, hiking, berry picking, and camping. Conversely, the presence of roads would serve to make the area less attractive to users seeking primitive recreation experiences. The roads may serve to displace current users of the area to areas with less development.

Obviously, the degree of change to the area is based on the amount of roads each alternative proposes. The more roads, the more opportunity for road-based (or in this case, more like trail-based) recreation. The longer the road systems, the more access they provide for hunting, hiking, berry picking, and general exploring. Alternatives 1 and 2 propose road systems in both the Canal and Hoya VCU's and would have the most potential for changing the recreation experience of the project area. Both alternatives propose a permanent change to two drainages. Alternative 2 proposes more overall roading than Alternative 1 (14.1 miles vs. 10.1), and would have the most effect to the project area of the alternatives proposed.

Alternatives 3 and 4 do not propose an LTF or road system in the Canal VCU, and although there would be evidence of logging in that drainage, the recreation potential of the Canal VCU would remain largely unchanged. Alternative 3 would propose a longer road system in the Hoya VCU than Alternative 4 (8.8 miles vs. 2.6 miles), and would provide more access in the Hoya drainage for trail-based recreation activities. By providing more access, however, it has more potential to change the recreation character of the drainage than Alternative 4.



### 3 Environment and Effects

#### Direct Effects to Recreationists and Outfitter/Guides

There was a concern from recreation users and outfitter/guides about how the activities associated with this sale would directly effect them throughout the life of the sale. People expressed concern about the presence of helicopters in the area making noise and disrupting the wildlife they had come to see (particularly the bears at Anan). Two mitigation measures are included in all action alternatives to address these concerns. First, helicopter yarding would not be allowed in the Canal VCU between May 1 and June 15, to avoid disturbance to bears with cubs upon emergence from hibernation. Second, helicopter flights associated with harvest operations would be restricted within 2 miles of the Anan Wildlife Viewing Area from July 1 through August 31. The second restriction would not affect yarding operations, but would direct any helicopter flights associated with the sale away from the concentration of visitors at the Anan Wildlife Observatory during the high use period.

Many people who frequent the general area of the proposed sale (particularly guides who take visitors to Anan) were concerned about what they were likely to experience when travelling near the Canal Hoya Project Area as a result of this sale. Although it is not possible to say exactly what to expect during the life of a sale in any given year, we have taken a "best guess" approach to describing what is likely to occur if a given alternative is selected. Actual activities may vary once the sale is sold.

Table 3-10 displays the type of activities that may be encountered which could affect users recreating near the Canal Hoya Project Area.

Table 3-10  
Logging Activities Associated With Each Alternative

|       | Canal LTF Use | Hoya LTF Use | Road Construction | Cable Logging | Heli Logging | Tugs/Rafts | Crew Traffic | Barges for Heli Yard to Water |
|-------|---------------|--------------|-------------------|---------------|--------------|------------|--------------|-------------------------------|
| Alt 1 | Yes           | Yes          | 2 seasons         | 3 seasons     | 3 seasons    | 3 seasons  | 3 seasons    | 3 seasons                     |
| Alt 2 | Yes           | Yes          | 2 seasons         | 3 seasons     | 3 seasons    | 3 seasons  | 3 seasons    | None                          |
| Alt 3 | No            | Yes          | 2 seasons         | 3 seasons     | 3 seasons    | 3 seasons  | 3 seasons    | 3 seasons                     |
| Alt 4 | No            | Yes          | 1 season          | 2 seasons     | 2 seasons    | 2 seasons  | 2 seasons    | 2 seasons                     |

Alternative 1 and Alternative 2 would be similar in that they would likely require a minimum of three years to complete. Both would propose LTF construction at the Hoya and Canal sites, which would likely take place the first year of the sale. Road construction would likely continue into the second season, with cable yarding and helicopter yarding expected throughout the 3 years. Both would require log storage near both LTF's, with associated tugs and other miscellaneous crew traffic. A main difference between the two alternatives is that Alternative 2 would not require any barges for helicopter yarding, as all logs removed by helicopter would be yarded to the road system and trucked to the LTF's.

Alternative 3 would likely take three years to complete, with expected activities similar to Alternative 1 (including the necessity to have barges for helicopter yarding). The main difference between Alternative 3 and the first two alternatives discussed is that Alternative 3 would not propose any road building or LTF construction in the Canal drainage. Alternative 4 would have the least impact to visitors using the area, as it would likely require two years for completion, and would not propose any road building or LTF construction in the Canal drainage.



## Issue Three: Anan Bears

*"Great as always!"*  
--Wrangell, AK

*"Fantastic! Bears galore!"*  
--Bristol, England

*"One of the highlights of  
my Alaskan trip"*  
--Sydney, Australia

*"Really great!! This is  
what Alaska is really all  
about."*  
--Danville, CA

*"Saw bears almost all the  
time, great!"*  
--Eau Claire, WI

*"Dream come true!"*  
--Wrangell, AK

*"Nothing like it  
anywhere."*  
--Oklahoma

Many tourists visit Southeast Alaska to get a glimpse of a bear - "the symbol of the Alaskan wilderness" (Schoen et al. 1992). The Anan Wildlife Viewing Area, located 1.5 miles to the west of the Canal Hoya Project Area boundary, is the kind of place where tourists and locals can make this dream a reality. The pink salmon that return to Anan creek in July attract numerous eagles, seals, gulls, bears and humans. More than 2,000 people visit Anan each year to view wildlife, especially the 30-60 black bears and 8-12 brown bears that frequent the area between July and September. As can be seen by the above excerpts from the 1997 visitor book, Anan is an internationally renowned site and a world-class bear viewing area.

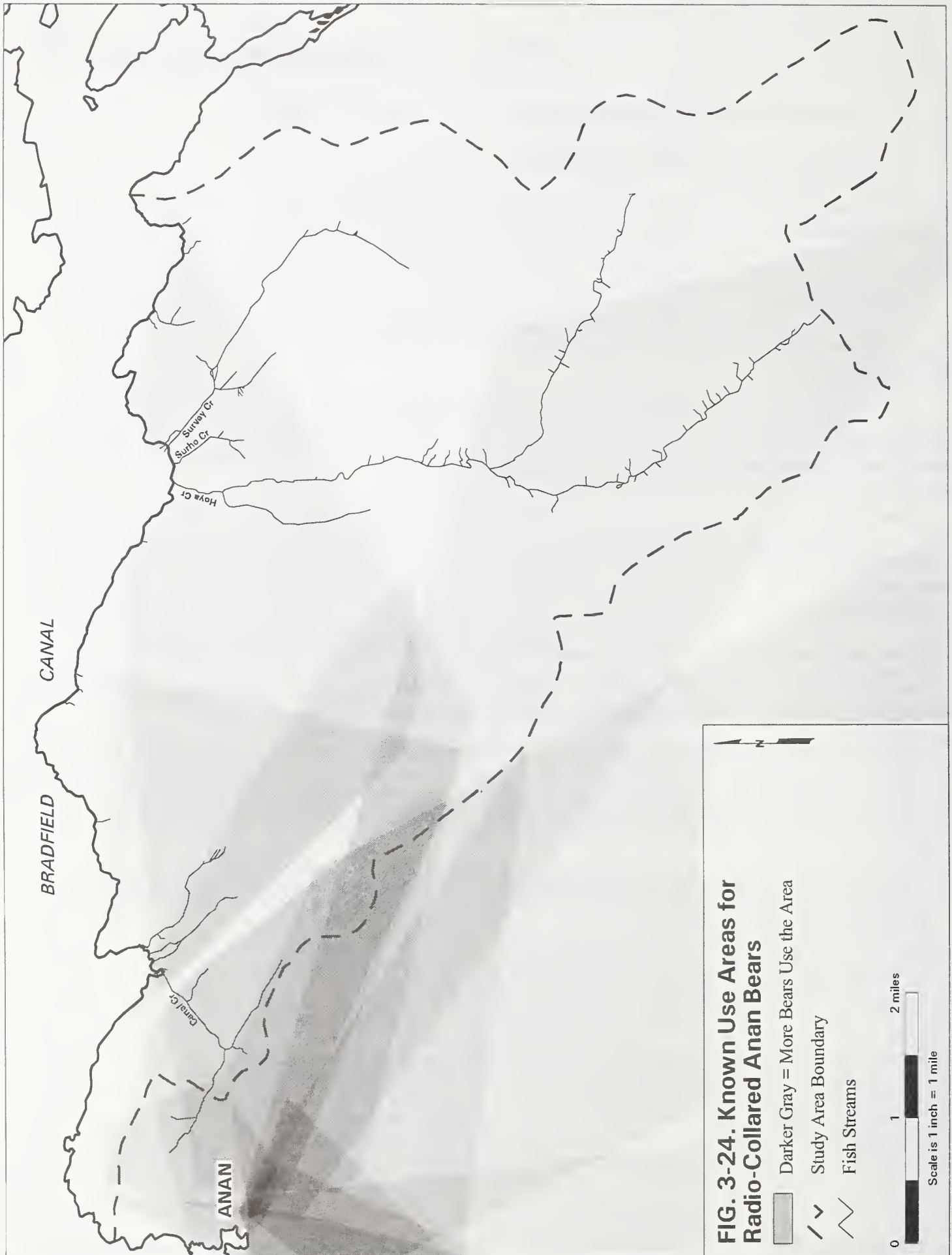
This is a wildlife and a recreation issue since the people who visit or make their living guiding visitors to Anan are concerned about the effects of the Canal Hoya Timber Sale on the bears. Guides are concerned about the disturbance caused by nearby logging operations on their business. We must consider future economic benefits of tourism since popularity of this viewing area is rapidly increasing. In 1997, 2,504 visitors stopped at Anan -- an increase of 300 compared to the previous year.

We have studied the distribution of the Anan bears through a radio telemetry study. In 1993, 13 black bears and one brown bear were radio-collared at the Anan wildlife viewing area. We tracked these bears for 3 years from a fixed-wing aircraft and plotted their monthly location on aerial photos (these points are referred to as bear "relocations" throughout this document). Since then we have analyzed habitat use of these bears and their distribution throughout the project area (USDA 1997c). It is good to keep in mind that in 1993, the year the bears were trapped, berries were abundant and the pink salmon run in Anan Creek was lower than average. This resulted in fewer bears than usual using Anan; therefore our results may be conservative and not represent bears that are occasional visitors or have a broader distribution (large home range). In other words, a differing bear use pattern may emerge if the study was repeated and collaring was done during a poor berry year.

We have made wildlife resources and wildlife viewing a top priority for the Anan watershed but we know that the Anan bears do not stay within these boundaries (USDA 1996). From the results of our Anan telemetry study we discovered that the general pattern of movement for the Anan bears is east/west. The Canal and Hoya VCUs where we are planning a timber sale lie to the east of Anan (Figure 3-24).

To gain an understanding of the effects of the Canal Hoya timber sale on bears in general, the habituated Anan bear population and viewing opportunities at Anan we discuss the following concerns:

- The distribution of Anan bears in the Canal Hoya area
- The effect of habitat changes to black bears
- The effect of habitat changes to brown bears
- How roads and other human disturbances impact bears
- The local bear population and existing mortality rate
- What we expect of habituated bears (bears that tolerate people)



## Distribution of Anan Bears Within the Project Area

Nine of the 14 radio-collared black bears at Anan denned or foraged in the Canal Hoya area. If we extrapolate this to our population estimate -- as many as 45 of the Anan black bears may spend time in the Canal Hoya area. Another way of looking at our data is to assume that the number of relocations for each bear that falls within the project area represents the amount of time that bear spends in the project area. Using this assumption, *Anan bears spent an average of 23% of their time in the project area* -- 15% within the Canal VCU and 7% within the Hoya VCU. The Canal Hoya project area is well within the home range averages we reported for the Anan bear population -- 3.5 square miles for females and 13.9 square miles for males.

We analyzed the distribution of certain groups of bears, specifically; females, regulars at the observatory and brown bears. The *four collared female black bears spent an average of 42% of their time in the Canal Hoya area*. The one brown bear we collared for this study spent 55% of her time in Canal Hoya. There were six collared bears that are considered regulars -- they repeatedly show up at the Lower Falls and are habituated to people. These *regulars spent an average of 23% of their time within the project area*.

Anan bears appear to use the project area more frequently during the Spring, Fall and denning periods. *Canal is an important denning area for Anan black bears*. Of the 25 den relocations; 48% were within Canal, 48% within Anan, 0% in Hoya and 4% in other areas. Canal relocations were primarily picked up during denning, Spring and Fall (in that order). The majority of Hoya relocations occurred in the Spring.

Anan black bears frequent Canal Hoya during the hunting season but currently appear to be relatively inaccessible. 72% of the black bear relocations in Canal Hoya occurred during the black bear hunting season (Sept. 1 - June 30) as compared to 48% of the relocations for the entire project area. Relocations of the one collared brown bear in Canal Hoya occurred outside of the brown bear hunting season (2 relocations in June and 4 in August).

The current likely area for human-bear encounters is along the beach. The bears in our study frequented the interior of Canal Hoya more than the beach. Only 13% of the Canal Hoya relocations fell within 500 feet of the beach compared to 87% of the locations in the interior. However, beach and estuary areas were important habitat types for Anan bears (see below).

## Habitat Use by Black Bears

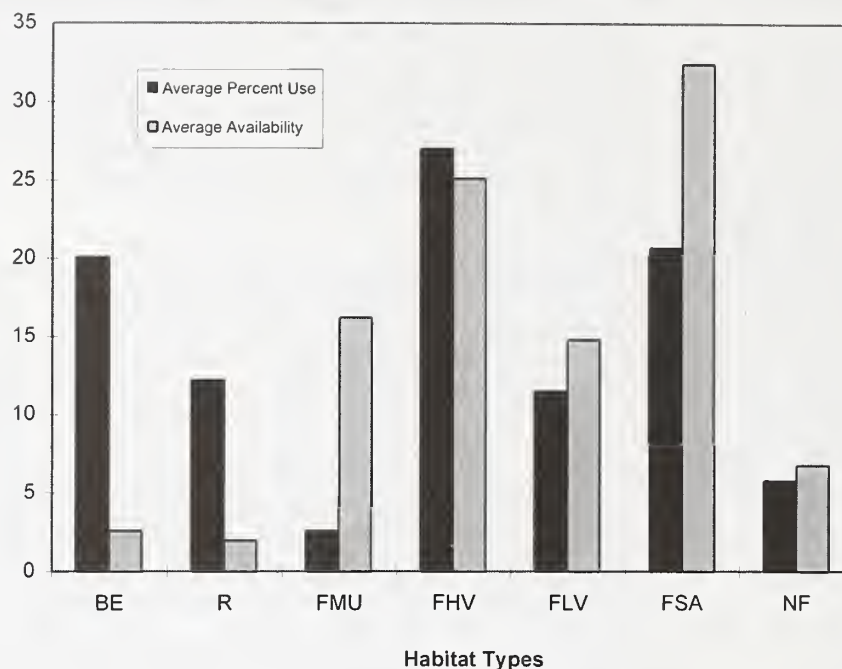
Black bears seek out different food sources during different seasons of the year and as a result use a variety of habitat types. In the Spring, bears feed on newly emergent vegetation found along the beach or in low elevation forests. During the early summer, bears move to mid-elevation habitats to feed on salmonberries and deer cabbage. In the Fall, they return to lower elevation riparian areas to feed on spawning salmon.

The most important habitat types for black bears in general and for black bears in our project area are riparian, beach, estuary and productive old growth forested stands (Figure 3-25). The Anan bears chose beach, estuary and riparian habitats over all other habitat types based on a use/availability analysis (USDA 1997c). We did not find a significant difference in black bear use of low and high volume forest for the bears we had radio-collared; however, forested high volume was the third highest ranking cover type.



### 3 Environment and Effects

Figure 3-25  
Average Percent Use and Average Availability of Habitat Types for Anan Bears



\*BE = beach/estuary, \*R = riparian, FMU = forested muskeg,  
FHV = forested high volume (>20,000 bf/acre), FLV = forested low volume (<20,000 bf/acre),  
FSA = forested subalpine, NF = nonforest.  
\* = significant use

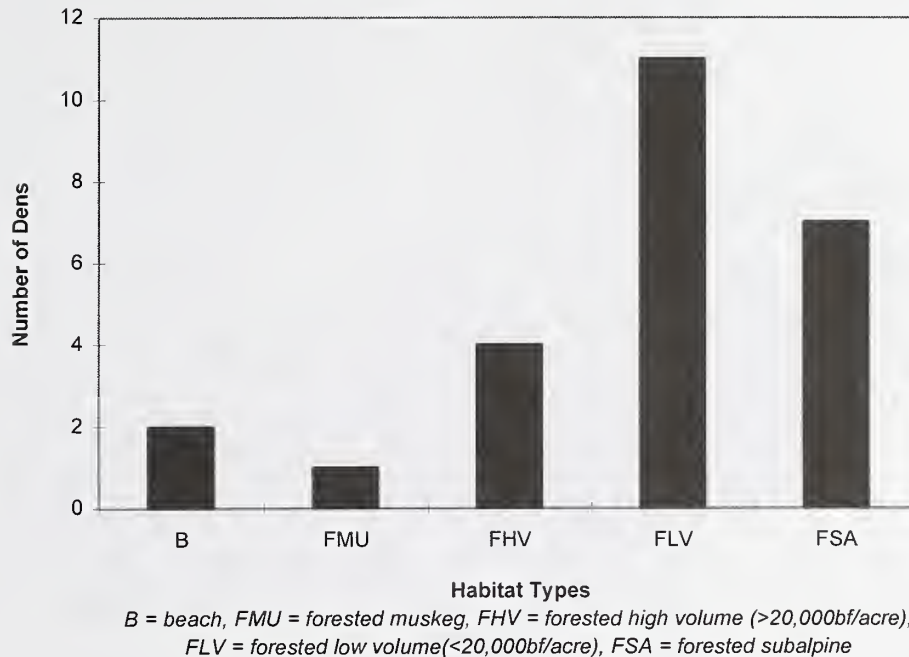
Cover is second only to food in determining the suitability of an area for bears in the Black bear Habitat Capability Model. Bears prefer a diversity of habitat types, but they will not forage far from the cover provided by mature forest stands (Suring 1993a). Females with cubs are especially sensitive and often will not forage more than 100 meters from forested cover-- an area where they can take refuge if threatened (Herrero 1978, Rogers 1977). Forested corridors are important for migrating black bears since they seek forested cover to escape from brown bear predation and hunters (Chi 1996).

We were unable to analyze the use of clearcuts by Anan bears but research in other areas indicates that the benefits of clearcuts to bears are short-lived. Clearcuts provide forage for black bears in the form of berries and receive high habitat suitability scores. These same areas are considered completely unsuitable after 25 years when canopy closure of the stand severely reduces available food supplies (Suring 1993a). Bear population increases caused by logging may be expected to decline as second-growth stands enter the phase of least forage production (Meehan, 1974).

Large-diameter trees are a critical habitat component for denning black bears. Black bears in coastal Alaska make extensive use of tree dens due to high ground moisture, limited soil development and variable snow cover (Erickson et al. 1982; Suring 1993a). All the dens (n=67) located for a study in coastal British Columbia were in or beneath large diameter (dbh = 40") trees or wooden structures derived from trees (logs, root boles, stumps) (Davis, 1996). Most of these dens were in yellow cedar (30%) or red cedar (28%). Although the black bear habitat model stresses the importance of high volume forested stands for denning, many of the dens in our study were in low volume stands (Suring 1993a, USDA 1997c).



Figure 3-26  
**Number of Den Locations by Habitat Type for Eleven Anan Black Bears**  
 (25 locations; avg. = 2.3 dens per bear)



Anan bears selected den sites within at least five different habitat types: beach, forested muskeg, forested high volume, forested low volume and forest subalpine (Figure 3-26). *The presence of a few large trees (>40" dbh) and a dry site may be the critical habitat features selected for by coastal denning black bears (Davis, pers. comm).*

The availability of secure den sites is critical to female bears. Reducing the number of den sites can lead to an increase in the number of cannibalism incidents of denned females and cubs (Davis, pers. comm). Dens need to provide thermal cover and security at this critical stage of a bear's life cycle.

*Den reuse may be as high as 50% for the Anan bear population indicating low numbers of adequate den sites in our project area (USDA 1997c).* Den reuse is generally low (e.g. 5 percent) throughout the range of the black bear (Suring 1993a). High rates of reuse (50%) may occur in areas where suitable dens sites are not abundant (Lindzey and Meslow, 1977). There was a 28% reuse of dens by radio-collared bears in coastal British Columbia -- another area where coastal conditions may result in a shortage of dry, secure den sites (Davis 1996).

### 3 Environment and Effects

#### Effects on Black Bear Habitat

The effect of each alternative on black bear habitat changes with the location and size of units and by miles of road open to foot-traffic. Gated roads are less detrimental to bears than are roads open to vehicles but still result in lower habitat values due to the potential for bear-human interactions. We ran the latest version of the interagency black bear cumulative effects model to look at changes in the suitability of habitats by alternative (Suring et al. 1993a). Table 3-11 shows the acres of suitable high value habitat by alternative for black bear. Table 3-12 shows the percent of existing habitat capability remaining by alternative. Figures 3-27 and 3-28 show where the existing high value habitat is and the conditions under Alternative 2, which would have the greatest effect on highly suitable black bear habitat.

Habitat in the Canal Hoya project area is expected to be less suitable for black bears when located within 1 mile of a road open to foot-traffic or an access point (Suring et al. 1993a). A higher impact is expected if these roads are within 1/2 mile of an anadromous fish stream. Additional disturbance factors of the habitat model do not apply in this sale since we are not planning any permanent camps, garbage dumps, cabins, or roads left open to vehicle use.

Table 3-11

**Acres of Existing Highly Suitable Habitat and Percent Remaining as High by Alternative for Black Bear.**

| Alternatives | Acres of high remaining | Percent of high remaining |
|--------------|-------------------------|---------------------------|
| Alt1         | 4524                    | 44                        |
| Alt2         | 4180                    | 40                        |
| Alt3         | 6253                    | 60                        |
| Alt4         | 7607                    | 74                        |
| Alt5         | 10339                   | 100                       |

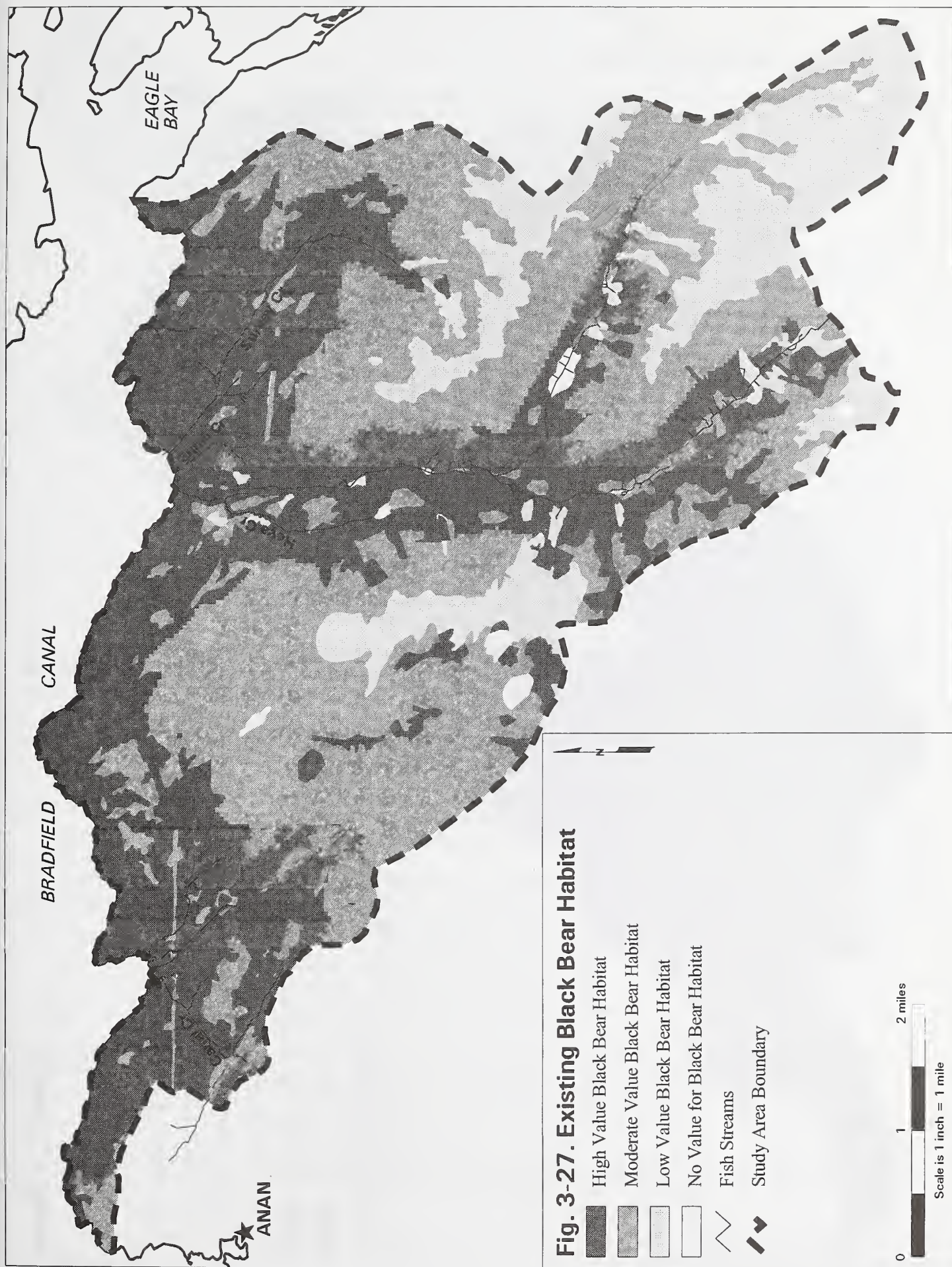
Table 3-12

**Percent of Existing Overall Habitat Capability Remaining by Alternative for Black and Brown Bear.**

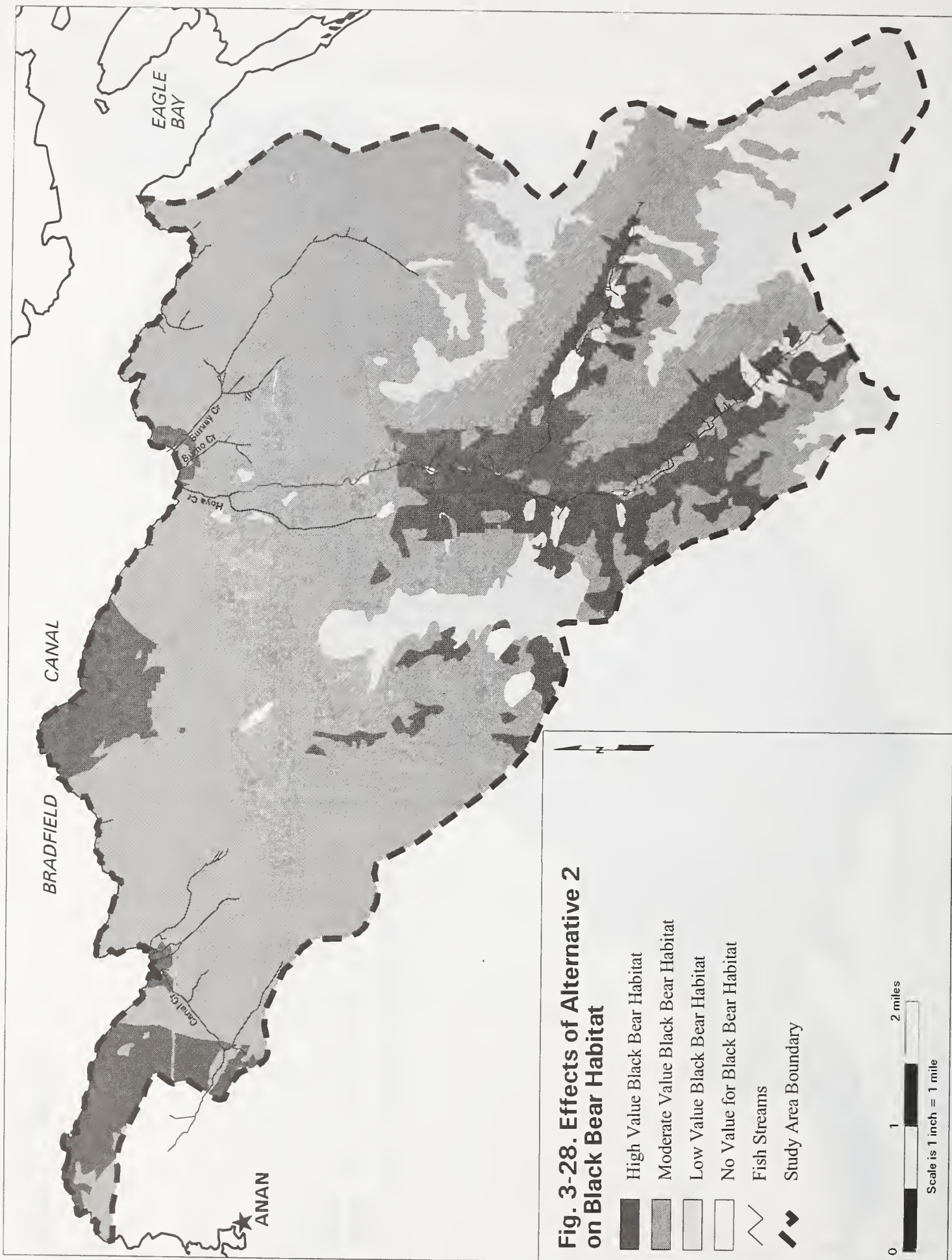
| Alternatives | Black bear<br>* (% habitat capability) | Brown bear<br>* (% habitat capability) |
|--------------|--|--|
| Alt1         | 84                                     | 92                                     |
| Alt2         | 81                                     | 90                                     |
| Alt3         | 87                                     | 94                                     |
| Alt4         | 91                                     | 96                                     |
| Alt5         | 100                                    | 100                                    |

\* percent is ratio of overall area hsi index values











*The effect of roads on bears is greater than the direct effects of removing habitat (see roads and habituation discussion, page 3-4 and 3-50). 81% or more of existing habitat capability of the area is retained under any alternative. 26-60% of highly suitable habitats for black bear becomes moderately suitable under any alternative largely as a result of the road disturbance component of the model. These changes in habitat acres may reflect small overall changes in carrying capacity. Acres of habitat do not disappear with timber harvesting but move into a less suitable category.*

Habitats that receive a significant amount of use by Anan black bears, the beach and estuary areas, will not be harvested. Measures to protect important foraging areas for brown bears have benefits to black bears as well (see brown bear habitat effects, page 3-43). Since salmon are a principal food source in July-September, alternatives that minimize risk to riparian habitat and fish production will benefit bears (USDA 1997a). All alternatives provide a high level of fish habitat protection (see Freshwater Resources discussion, page 3-78). In summary, Alternative 2 has the biggest impact on bear habitat values followed by Alternatives 1, 3 and 4.

Denning habitat will be maintained for black bears within riparian, beach and estuary buffers and within the Old Growth Reserves. Davis (1996) states "the retention of stands within landscapes provides the best means for the maintenance of adequate numbers and supply of dens. Retention of patches within stands provides the next best option, and the retention of elements provides the only option better than supplying none at all." The Canal Old Growth Reserve was designed to include several known den locations (see Old Growth Reserve discussion, page 3-61) and to provide a buffer between Canal and Anan. We have included retention within our units with the objective of maintaining den trees. Below is a list of recommendations for maintaining denning habitat (Davis 1996) and a description of how we are applying these mitigation measures within all alternatives:

*We have protected important denning habitat and would retain denning trees.*

- **Identify areas with high densities of dens and manage for retention of adequate amounts and distribution of denning habitat.**

Landscapes should contain areas such as Old Growth Reserves that contain quality denning habitat. Denning habitat should be uniform across the landscape since the portion within the Old Growth Reserve will only provide dens for a portion of the population. "The supply of dens should occur across the landscape and not be concentrated into a few patches".

*We have protected important denning habitat within the Canal Old Growth Reserve. Denning trees would be retained across the landscape within harvest units using reserve clumps and diameter-limit prescriptions.*

*We would protect habitat around known den sites.*

- **Retain patches of trees around dens found in trees in areas to be clearcut.**

Trees with entrances above ground level are especially important and should always be retained in wind-firm patches. Wildlife tree patches containing den structures should be > 0.5 ha. It is important to retain more than just the standing tree since vegetational complexity around the den site is important to denning bears.

*We would protect habitat around known den sites. We would attempt to place reserve clumps around any new dens that are located.*

*Some large green trees would be retained*

- **Retention of green trees should focus on large declining green trees.**

Patches of leave trees should contain trees that have denning potential in the future. "Yellow cedar and western red cedar are probably the most important source of den structures because of their decay characteristics". Hemlock and Sitka spruce are also used as denning structures.

*Large green trees would be retained in reserves and for units with an upper diameter limit. Units 41, 44, 45 and 47 in Canal have an upper and lower diameter limit.*

### 3 Environment and Effects

*We would avoid disturbing denning black bears.*

- **Timber harvesting should avoid displacing denned black bears.**

Activities that induce den abandonment should be avoided. Female black bears with nursing cubs may remain at the den site into May. Activities should be avoided within 30 meters of the den site until the bear has left on its own volition. Harvesting during the summer when bears have left the den will mitigate these effects. Black bears have been reported to abandon dens and their cubs when closely approached by humans or other predators.

*We would avoid disturbing denning black bears by limiting activities around any active dens discovered during logging operations. A timing restriction in Canal would reduce the amount of helicopter disturbance during the Spring (before June 15th) when females and cubs may be at den sites*

- **Retain large pieces of coarse woody debris (CWD) in new clearcuts.**

Logs should be 40" in diameter and 15' long. Logs removed from fallen trees should be cut 15' from the rootwad. Stand activities such as thinning should not disturb existing pieces of CWD. Cedar logs that are beginning to show signs of decay should be retained. Salvage activities and firewood cutting should be regulated to ensure that denning capability is not compromised.

*Large logs would be retained within Units 41, 43, 44, 45 and 47.*

- **Selected large trees should be cut >6' above their base (high stumping) to allow for the formation of den sites under stumps.**

*We would apply high stumping to selected trees identified as suitable den sites within Units 44, 45 and 47.*

#### Habitat Use by Brown Bears

Alaska is one of the few remaining areas of the world with healthy brown bear populations and the future of these populations is "inextricably linked with forest management" (Schoen et al. 1992). Brown bears have been eliminated from 99% of their former range and in 1975 they were listed as threatened in the United States south of Canada (Wilcox 1996). Schoen (1992) states "Loss of habitat to human encroachment and resource development is a serious problem for bear management in the contiguous 48 states and elsewhere".

As with black bears, habitat use of brown bears varies seasonally, which is believed to be a response to seasonal difference in food quality and availability. Bears emerge from dens in April and May and seek out old growth forests, coastal sedge meadows and south-facing avalanche slopes. In early summer (mid-June through mid-July) bears move to forested slopes and meadows to seek out newly emergent vegetation. From mid-July through early September most bears move to riparian habitats, primarily spruce devil's club communities, to feed on anadromous fish. Some bears (primarily females) do not use coastal fish streams and are considered "interior bears" (Schoen et al 1994).

Brown bear population declines can be expected as a direct result of habitat loss. On northeast Chichagof, a 23% decline in brown bear populations was predicted to occur in 50 years after a 50% removal of harvestable timber (Schoen 1994). Riparian areas, floodplains and late successional forested stands are important habitat types for brown bears (Schoen et al 1994). The Forest Plan recommends that a "minimum 500 foot no-harvest riparian buffer be maintained along streams considered important for brown bear foraging."

Clearcuts are not used extensively by brown bears. During a radio-collar study on Chichagof Island, only 2.8% of 854 relocations of radio-collared bears occurred in clearcuts (Schoen and Beier 1990). Although clearcuts occurred frequently along low elevation valleys and



adjacent to streams -- areas used extensively by bears in late summer - they were essentially avoided by brown bears (Schoen and Beier 1990). Many of the berries (devil's club, currant and salmonberry) which brown bears prefer are more abundant in riparian and avalanche slopes than in clearcuts. In the habitat model for brown bears, clearcuts receive a lower habitat suitability ranking than old growth. Second growth stands (25-150 years) have no habitat value to brown bears due to the lack of understory vegetation (Schoen 1994).

*Generally forest management activities have minor effects on brown bear denning habitat* (Schoen et al. 1992). Most bears move to upper elevations by mid-September before denning. Although cave denning is common, dens are also commonly observed at the base of large old growth trees and snags. Fifty-two percent of brown bear dens on Admiralty Island occurred in old-growth habitat (Schoen et al. 1992). To minimize loss of denning habitat as a consequence of logging, Schoen et al (1987) recommend avoiding logging on mid-volume (20-30mbf), hemlock-spruce stands on >20 degree slopes above 300m elevation adjacent to area of brown bear concentrations.

## **Effects on Brown Bear Habitat**

The effect of each alternative on brown bear habitat changes with the location and size of units and by miles of road open to foot-traffic. We ran the latest version of the interagency brown bear cumulative effects model to look at changes in the suitability of habitats by alternative. Disturbance factors listed in the brown bear model that apply for this timber sale include: access points (LTF) and disturbance within 1 mile of temporary roads. Gated roads are less detrimental to bears than are roads open to vehicles, but still result in lower habitat values due to the potential for bear-human interactions (Schoen et al. 1994). All camps are floating and there would be no landfills as a result of this project. We also analyzed the impact of each alternative on brown bear denning habitat. Tables 3-15 and 3-14 show the acres of highly suitable habitat and percent of area habitat capability remaining by alternative. Figures 3-29 and 3-30 show where the high value habitat is and the locations of units in Alternative 2, which would have the greatest effect on highly suitable brown bear habitat.

*The effect of roads on bears is greater than the direct effects of removing habitat* (see roads and habituation discussion, page 3-44 and 3-50). 90% or more of existing habitat capability of the area is retained under any alternative (Table 3-14 under black bear habitat section). All alternatives retain more than 90% of highly suitable brown bear habitat (Table 3-15). Changes in habitat acres may reflect small overall changes in carrying capacity. Acres of highly suitable habitat do not disappear with timber harvesting but move into a less suitable category. In summary, Alternative 2 has the biggest impact on bear habitat values followed by Alternatives 1, 3 and 4. Alternative 2 also removes more acres of denning habitat than other alternatives (Table 3-16).

*Important brown bear foraging streams are protected under all alternatives. Most of the Hoya creek, survey creek and a tributary between the two (Surho creek) were identified as important brown bear foraging streams.* No harvesting will be done within 500 feet of the anadromous fish spawning portions of those streams. Anadromous fish streams in Canal are limited in extent and are protected by the 1000 foot beach buffer. Since salmon are a principal food source in July-September, alternatives that minimize risk to riparian habitat and fish production will benefit bears...(USDA 1997a). All alternatives provide a high level of fish habitat protection (see Freshwater Resources discussion, page 3-78).



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Table 3-13

**Acres of Existing Highly Suitable Habitat and Percent Remaining as High by Alternative for Brown Bear**

| Alternatives | Acres of high remaining | Percent of high remaining |
|--------------|-------------------------|---------------------------|
| Alt1         | 373                     | 96                        |
| Alt2         | 379                     | 97                        |
| Alt3         | 379                     | 97                        |
| Alt4         | 381                     | 98                        |

Table 3-14

**Acres of Brown Bear Denning Habitat and % Remaining by Alternative**

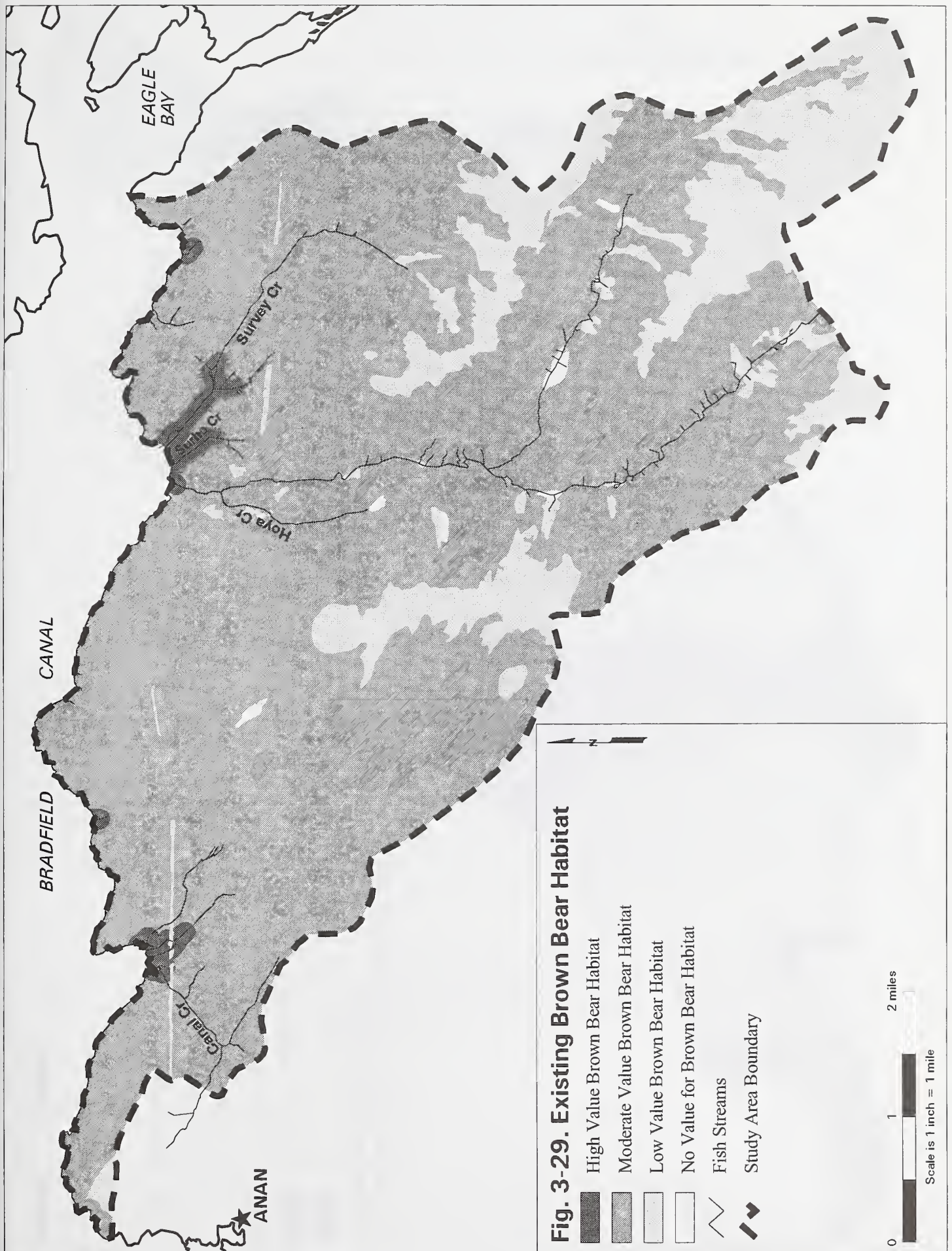
Denning habitat is defined as mid-volume stands, >20 degrees and > 300 meters in elevation (Schoen et al. 1992)

|       | Acres of Denning Habitat | Acres Removed | % Remaining |
|-------|--------------------------|---------------|-------------|
| Alt 1 | 1912                     | 73            | 96          |
| Alt 2 | 1851                     | 134           | 93          |
| Alt 3 | 1896                     | 89            | 96          |
| Alt 4 | 1905                     | 80            | 96          |
| Alt 5 | 1985                     | 100           | 100         |

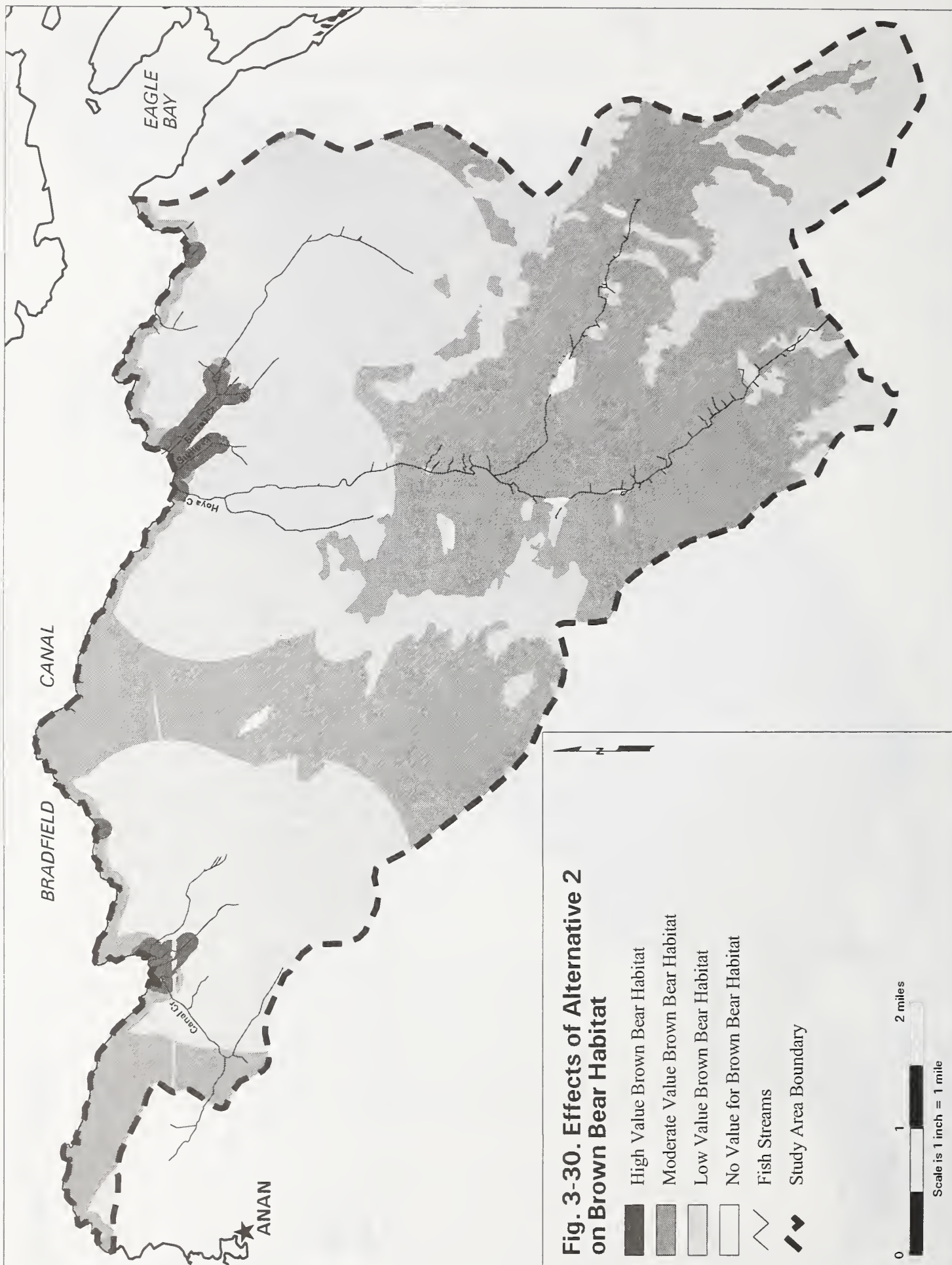
#### The Impact of Roads and Disturbances on Bears

Roads and other human disturbances (facilities, camps, dumps) lead to an increase in bear-human encounters which in turn may lead to bear population declines and reduced bear densities. *Total density of black bears can be reduced by increases in human-related mortality (other than legal hunting mortality) that result from environmental disturbances* (cited in Suring 1992). Black bear populations have been shown to decline in direct relationship to the extent of bears interactions with people (Powell 1993). Mattson (1993) states that "direct-human caused mortality is the arguable cause of virtually all grizzly bear population declines ... and that human access is a primary mediator of this mortality "(Mattson 1993).

We know that roads and developments lead to increased bear mortality but can only estimate what that mortality rate would be. Legal hunting of bears can be managed but *it is very difficult to control illegal kills, wounding loss and bears shot in defense of life or property*. "On the Kenai Peninsula in Alaska, where reporting is thought to be fairly complete, wounding loss of black bears was estimated to be 13-16% of reported kill based on mortalities of radio-marked bears "(cited in Sterling 1990). In 6 studies of marked grizzly bears, 26% of mortalities were caused by illegal harvests compared to 42% by legal hunting (McLellan 1990). Studies on Chichagof Island have demonstrated a direct relationship between the number of brown bear kills and cumulative kilometers of road construction (Titus and Beier 1991).









Human activity along roads and at facilities can also displace bears from critical habitat. Radio-collared brown bears on Chichagof remained much farther away from salmon streams in highly roaded and clearcut watershed due to a lack of cover, however their tendency to use roads and forest patches resulted in more human-bear encounters and increased mortality (Titus and Beier 1991). Black bears have been known to abandon dens and even cubs when disturbed at their denning location (cited in Davis 1996).

Human disturbances are an important component of the habitat model for both brown and black bear. Primary disturbance factors identified in the recent Habitat Capability model for brown bears include: permanent camps, communities, landfills, and vehicle-accessible roads (Schoen 1994). Open-pit dumps and permanent camps have the biggest impact on black bear habitat quality (Suring 1993a). Roads open to vehicles have the greatest impact on bears. Roads closed temporarily (gates) are more detrimental than those closed permanently since they will generally still have some level of off-road vehicle traffic (Schoen 1994). *"All roads, regardless of closure, still have the potential for supporting additional human foot traffic which also influences bear populations."* (Schoen 1994). Brown bears do not avoid secondary and blocked roads, thus they are likely to encounter humans along these systems (Titus and Beier 1991).

Disturbance as a result of timber harvesting may have a bigger impact on brown bears in the late summer (mid-July through mid-Sept.). This period is believed to be the most critical time period for brown bears because they are concentrated along coastal salmon streams - areas where the most abundant and high quality food is available. Schoen (1994) states "we believe that brown bears are most vulnerable to human-induced mortality (aside from legal hunting) at this time and place".

## Effects of Roads and Disturbances on Bears by Alternative

The impact of roads and disturbances on bears is an important component of the habitat models and is reflected in these results (see habitat discussions). For bears in general we can compare this impact by evaluating the miles of road by alternative. Alternative 2 has more road miles than other alternatives followed by Alternatives 1, 3 and 4.

To further evaluate this impact on the Anan bears we applied a 1 mile buffer around roads and access points and calculated the average percent time spent within this buffer by the radio-collared Anan bears. We are assuming that "percent time" is represented by the percent of relocations that fall within this disturbance zone for each bear. The average percent time that Anan bears spent within the disturbance zone for any alternatives (other than no action) ranged between 2 and 13%. Alternatives 2 (13%) and 1 (12%) have the greatest disturbance impact on Anan bears. Alternatives 3 (6%) and 4 (2%) have the least impact because there are no roads in Canal.

Road impacts are partially mitigated by installing gates at both LTF sites to eliminate recreational vehicle use on the roads. The Forest Plan states the following standard:

*"Manage road use where concentrations of brown bear occur to minimize human/bear interactions and to help ensure the long-term productivity of brown bears. To meet this direction, develop and implement road management objectives through an interdisciplinary process"*

*"Manage road use where concentrations of brown bear occur to minimize human/bear interactions and to help ensure the long-term productivity of brown bears. To meet this direction, develop and implement road management objectives through an interdisciplinary process"*

# 3 Environment and Effects

## Bear Populations Within the Project Area

Baseline data on bear population density and composition is very important for bear management purposes but difficult to obtain (Miller 1990). In addition, there can be a significant lag effect time between when habitat degradation occurs and when habitat degradation effects show up in terms of a bear population decline (Doak 1995). "The costs associated with unintended population declines and the difficulties of detecting such declines until they are far advanced mandate a conservative approach to bear population management (Miller 1990)."

We have used Habitat capability models in the past to estimate carrying capacity but these numbers have a high degree of error associated with them (see MIS discussion, page 3-70). Our models predict that habitat within this Wildlife Analysis Area (WAA -- Canal, Hoya and Eagle rivers but not Anan) will support 97 black bears (SDEIS 1991). ADFG (1993) states that current black bear populations in GMU 1 remain stable and high. The population of brown bears for this WAA was estimated to be 24 animals (SDEIS 1991). ADFG (1994) reports the brown bear population in this area as stable but "bear-human interactions and conflicts from increased access and development remain a concern." *Most of the long term concern for brown bear populations is related to the low density mainland bear populations* (USDA 1997a).

Current legal harvest of black bears in our project area is low. Four black bears were harvested between 1980 and 1995 (SDEIS 1991, ADFG harvest report 1997). Sustainable harvest rates for black bear range between 7-14% (Miller 1990, SDEIS 1991). In the last ten years, one bear was taken in the Canal drainage and one in the Eagle river drainage, east of Hoya (ADFG harvest report 1997). The age/sex composition of black bears at Anan was stable during the course of a three year study. The relatively large proportion of large adult males suggests that this population is not heavily exploited. (Chi 1996)

Current legal harvest of brown bears may be at the upper limit of what this population can support. Eleven brown bear were harvested in this WAA between 1987 and 1995 which equates to 5% of the estimated population. Sustainable harvest rates for brown bears range from 4-5.7% (SDEIS 1991, Miller 1990). Five of the eleven brown bears harvested were females which exceeds state management objectives for proportion of females harvested (ADFG 1995). *One of three marked Anan brown bears, a 4 1/2 year old female, was harvested in the Eagle river drainage -- demonstrating the movement and susceptibility of this population across our project area.* Eight of the eleven bears were harvested by nonresidents. ADFG reports that the percentage of successful brown bear hunters in GMU 1 that were non-residents increased between 1985 and 1990 from 13% to 30%.

It is very difficult to estimate how many Anan bears will be illegally harvested in the future or killed in defense of life and property (see road discussion, page 3-44). Chi (1996) states "with the increasing popularity of bear viewing and continued habituation of the bears to people throughout their lifetime these bears will be especially vulnerable to illegal hunting throughout the Cleveland Peninsula ...an increasing rate of commercial sales of bears parts makes this issue ("illegal hunting") even more critical for bears and the integrity of the ecosystem." (Chi 1996).



## Effects on Bear Populations

We know that the Anan bears do not stay within the Anan watershed and we know that they frequent the project area (see distribution discussion, page 3-35). The Anan Environmental Analysis (USDA 1996) lists the following objectives that relate to the local bear population:

*--"No net loss of habituated/visible bears at the falls for more than two consecutive years. Cubs continue to use Anan as they become adults and are recruited into the population."*

*-"No net loss of habituated/visible bears at the falls for more than two consecutive years. Cubs continue to use Anan as they become adults and are recruited into the population."*

*--"Maintain a well distributed bear age and sex ratio indicated by the continued use of the area by family groups, cubs that return as adults, and use by dominant males."*

*-"Maintain a well distributed bear age and sex ratio indicated by the continued use of the area by family groups, cubs that return as adults, and use by dominant males."*

Given the size of the local black bear population and the current low level of hunting, we do not expect large changes in overall black bear density as a result of this timber sale (see habitat discussion). However, we do expect to lose individual bears -- especially those animals that are highly habituated. We cannot guarantee that objective one (above) would be met with any alternative other than the no action. We may meet objective two if hunting pressure does not increase and/or if other mortality factors are controlled (illegal harvest, harvest in defense of life and property). Alternative 2 would have the biggest impact on black bear populations followed by Alternative 1, 3 and 4. Alternatives 3 and 4 have much less of an impact than 1 and 2 because they do not include a road in Canal. The average home range of Anan black bears falls within the Canal area and does not extend into Hoya.

All alternatives (other than no action) pose risk to brown bear populations by increasing access for the following reasons:

- There is a greater concern over the viability of mainland brown bear populations than for other subpopulations in Southeast (USDA 1997a). Risk to these population remaining viable is exacerbated by roading and human access.
- Current hunting pressure in the project area on brown bear takes 45-50% females, is increasing and may be at the upper limit of what this population can withstand.
- Loss of brown bears as a result of illegal take or bears shot in defense would add to this mortality
- Loss of habituated females (see discussion below) may have population impacts due to relatively low reproductive rates.

*"Manage human/bear interactions to limit brown bear mortality from both illegal kills and defense of life and property. Work with the Alaska Department of Fish and Game to develop and implement a brown bear management program which considers both access management and season and bag limits to manage brown bear mortality rates within sustainable levels."*

As with black bears, roads pose the biggest problem and the ranking of alternatives matches that of black bears. Alternatives 3 and 4 create more risks for brown bears than for black bears since Hoya roads falls within their average home range.

We would mitigate effects on bear populations through road closures and the development of a bear mortality monitoring plan. Through an administrative order we would close roads to vehicle use during nonworking hours which would reduce the amount of hunting that occurs during the sale. The Forest Plan directs the Forest Service to develop management programs in cooperation with ADFG to address brown bear mortality with the following S&G: *Manage human/bear interactions to limit brown bear mortality from both illegal kills and defense of life and property. Work with the Alaska Department of Fish and Game to develop and implement a brown bear management program which considers both access management and season and bag limits to manage brown bear mortality rates within sustainable levels."*



### 3 Environment and Effects

#### Behavior We Can Expect from Habituated Bears

A goal for the Anan wildlife viewing area is to make people predictable to bears and to encourage habituation of bears (i.e. make bears tolerant of people). Making people predictable reduces the chance of 'surprises' to bears and negative encounters, as well as increasing the chances that bears will be seen. "Predictable and consistent interactions are instrumental in providing for safe visitor experiences by encouraging habituation of bears to the schedules and places of people (Aumiller 1994, Herrero, 1994)."

We need to consider how habituated bears from Anan would react to "unpredictable" people encountered at Canal Hoya. Harvest units in the project area are as close as 1 1/2 miles from Anan - a distance that may be perceived as "far" to a human being and "not so far" to a bear. The behavioral study at Anan focused on the bears at that particular site and did not assess the behavioral response of bears to people on other drainages some distance away. However, Chi (1996) reports that habituated bears did not act differently at the upper falls - an area where they did not necessarily "expect" to run into people (Chi, pers. comm). Other researchers have found that bears may be tolerant of people's activities in areas where interactions are expected and innocuous, but avoid or show aggression towards people when encounters occur in novel locations (McLellan and Shackleton 1989). Brown bears that have been wounded by firearms may act aggressively toward people or abandon an area altogether (Gilbert 1993).

Habituated bears are more likely to come into contact with human food and are more likely to be killed than non-habituated bears. Mattson (1992) found that *"human-habituated and food-conditioned bears were 2.9 times as likely to range within 4 km of developments and 3.1 times as often killed by humans compared with non-habituated bears."* Bears that become food conditioned can become aggressive when seeking food from people (Olson 1993). Human garbage is a major contributors to bear attacks on humans (Herrero 1985). Habituated bears at the McNeil River State Game Sanctuary were found to be safer in the absence of a food reward than wary non-habituated bears (Aumiller 1994)."

Females bears are more likely to become habituated to humans and may be more likely to frequent the project area. Females bears at Anan distribute their use evenly between the upper and lower falls indicating a higher level of habituation to people (Chi 1996). Subadults and females are more likely to be displaced by other bears from feeding areas (such as Anan). *"High mortality of adult females and subadult males during small seed crop years was a consequence of their tendency to range closest to human facilities. They also had a higher frequency of human habituation compared with adult males."* (Mattson 1992)

## **Effect on Habituated Bears and Anan Viewing Opportunities**

Harvesting high-value habitat and increasing access with roads has the potential to impact habituated bears at Anan and affect recreational viewing opportunities. Habituated bears (bears that tolerate people) are ones observed on a regular basis and provide a viewing experience at times when other bears are not present. For example, in 1996 one subadult brown bear and one female with three cubs were present nearly every day and were "the brown bears" seen by visitors. In 1997, many visitors saw brown bears as a result of a return of these three cubs from 1996. One objective for the Anan observatory is: *"No net loss of habituated/visible bears at the falls for more than two consecutive years. Cubs continue to use Anan as they become adults and are recruited into the population."* We know that habituated Anan bears and female Anan bears spend a large percentage of their time in the project area (23% and 42%. See distribution discussion, page 3-35).

The biggest effect of the Canal Hoya timber sale on Anan bears would be the loss of habituated female bears as they encounter people along new road systems. *Female bears with cubs and brown bear females that frequent the Anan lagoon provide optimal viewing opportunities for people visiting Anan.* Female bears are more likely to become habituated than males and experience higher mortality as a result (Mattson 1992, Chi 1996). *Habituated female bears from Anan are the group most at risk as a result of hunting, illegal kill and kill in defense of life and property.* This has implications for Anan viewing and for the brown bear population (see population discussion, page 3-48). The impact of removing a habituated female from the Anan bear population includes the loss of future offspring that learn habituation from their mother.

Increased access (roads and LTFs) would increase the likelihood of Anan bears coming into contact with human food. Extreme efforts are being taken at the Anan observatory to prevent food-conditioning since this leads to dangerous bear-human encounters. Conflicts between campers and bears have occurred at Anan in the past which is why camping is not allowed at Anan. The Anan EA states: *"reduce, eliminate, or modify human behaviors that pose a high risk of temporarily or permanently displacing bears. Eliminate human behaviors that have a high to moderate risk of causing bears to become food-conditioned."* We have mitigated some of these effects by choosing a floating logging camp where human garbage would be inaccessible to bears. We do not know how many people would choose to camp or hike along new road systems in the project area. Existing camping along the beach occurs infrequently. Gating roads at both access points would also mitigate these effects.

The potential for any of these alternatives to impact viewing opportunities is best represented by a measure of miles of road since this is where we expect human-bear encounters and loss of habituated bears and food-conditioning to occur. Alternative 2 has the greatest impact on habituated bears and viewing opportunities followed by Alternatives 1, 3 and 4.

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## Issue Four: Wildlife Habitat and Species Conservation

**Biodiversity and Viability** The National Forest Management Act (NFMA) requires that the Forest Service provide for the diversity of plants and animals, based upon the suitability and capability of each National Forest, as a part of meeting overall multiple-use objectives (16 USC 1604(g)(3)(B)). “Biodiversity may be defined as the distribution and abundance of all of the plant and animal communities and species within an area, or as the variety of life and associated ecological processes (USDA 1996). As an example of one scale of diversity: the Tongass provides habitat for 54 species of mammals, 231 birds and 5 amphibians.

Maintaining biodiversity over time requires a close look at species viability. The Forest Ecosystem Management Assessment Team defined viability as “the likelihood of a species persisting well distributed throughout its range for a century or longer” (FEMAT 1993). The Forest Plan considers two wildlife groups in its viability assessment: the widely-distributed group and the endemic group. Species from the widely-distributed group that may be present in the Canal Hoya project area include: black bear, Canada lynx, wolverine, fisher, northern flying squirrel, river otter, mountain goat, silver-haired bat, California Myotis, Keen’s Myotis, little brown Myotis and long-legged Myotis. Species in the endemic group that may be present include red-backed vole subspecies (*Clethrionomys gapperi*) and ermine subspecies (*Mustela erminea*).

*29% of the world’s remaining unlogged temperate rainforest is within the Tongass*

Biodiversity and viability need to be assessed on a number of scales (global, regional, local...). On a global scale, 56% of the world’s temperate rain forests remain undeveloped and 29% of the remaining unlogged acreage is within the Tongass. These numbers may explain why there is a high level of outside interest in the management of the Tongass. To gain a more regional perspective an ecosystem approach was applied to subdivide the Tongass National Forest into 21 unique ecological provinces. The area that includes the timber sale we are proposing has been classified as a part of the North Misty Fjords Province. This province is characterized by “considerable topographic relief, as compared to South Misty Fjords with a colder, mainland-type climate with many glaciers. Vegetation occurs in long, narrow strips along the valleys and lower slopes of fjords. Much of the vegetation is muskeg, with cottonwoods in some of the river bottoms and subalpine fir along the Canadian border.” (USDA 1996).

### Effects on Biodiversity and Viability

Based on the most recent regional analysis, this province is not one of the ten “high risk” areas for loss of biodiversity (USDA 1996). A committee report indicated a medium to high probability of maintaining species viability within this province over time (Suring et al. 1993b). However, Revilla Island and the Cleveland Peninsula to the south are considered “high risk” areas for species viability. The Old Growth Reserves within the project area and the forested connections between these reserves are designed to maintain biodiversity and wildlife viability (see Old Growth Reserve and corridor discussions, page 3-61 and 3-59). Additional old growth habitat will remain within beach, estuary and stream buffers and on lands unsuitable for timber harvest.



## Wildlife Habitat

### Fragmentation

Loss of forested habitat, increased access and forest fragmentation are all impacts that occur with harvesting and ones we consider important in our wildlife analysis. Loss of forested habitat, at least temporarily, is the most obvious and unavoidable impact of logging. The development of roads and facilities associated with logging practices may increase access to game species and create dispersal barriers. "Forest Fragmentation" is the term we use to describe a process in which a forest block becomes subdivided into smaller more isolated units. When fragmentation occurs in a forested environment we see an increase in the amount of "edge" habitat and a decrease in "interior" forested habitat. Fragmentation, which isolates small populations, contributes to decreased population distribution and increased likelihood of local extirpation.

The Tongass forest is characterized by fragmentation at many scales and is fragmented by different disturbance processes. On a small scale, single tree gaps within a 400 year old Sitka Spruce stand provide habitat for forest interior birds such as the Hairy Woodpecker. On a broader scale, large patches of wind disturbance of 10 acres or more create nesting habitat for songbirds such as the Orange-crowned warbler. From a regional perspective, the Tongass National Forest is highly fragmented due to numerous islands and dramatic topographic relief. Our wildlife analysis for this report covers disturbance and fragmentation at the landscape-level (the Canal and Hoya VCU's).

Timber harvesting is a relatively new disturbance within the Tongass forest ecosystem with many unknown impacts to wildlife species. In addition, timber harvesting adds to the level of fragmentation or edge that is occurring naturally. The effect of harvest-level fragmentation would vary with the dispersal of units and their proximity to large existing forest blocks. Simulation studies have indicated that when 50% of a watershed is harvested with a staggered setting design, little if any forest interior remains. Whether a particular patch pattern and degree of fragmentation is beneficial or deleterious largely depends on the characteristics of the species using the landscape (Morrison, Marcot & Mannan 1992).

Traditional wildlife and forest management techniques focused on maximizing edge habitat to benefit wildlife species such as the ruffed grouse. Today, a broader perspective of wildlife ecology recognizes that certain groups of wildlife prefer forest interior habitats not affected by openings or abrupt edges created by timber harvesting. Research indicates that many predators hunt along edge habitats thus decreasing the habitat suitability of these types for birds and small mammals. Species such as the goshawk, may hunt along edge types but prefer old growth forest conditions for nesting.

### Effects on Fragmentation

We can compare the present level of fragmentation in Canal Hoya to each alternative by comparing the acres of edge and interior forest. Definitions of edge can be confusing because they vary for the species being considered and by habitat types. For example, studies indicate that the edge that is created between harvest units and forested habitat is biologically different from "natural" edge types. Research has shown that edge effects may extend up to two to three tree heights into the forest stand (Harris, 1984). Edge in our analysis is defined as the forested habitat within 300 feet of a nonforested opening of 5 acres or more. Figure 3-31 shows large forest blocks across the landscape (note that there are many natural breaks within these blocks if we look at it on a finer-scale). Table 3-15 displays the existing acreages of forested interior and edge habitat in the Canal Hoya project area. Alternative 1 would lead to the highest degree of fragmentation followed by alternatives 2, 3 and 4.





Table 3-15  
Measures of Fragmentation Effect by Alternative

|                  | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 |
|------------------|-------|-------|-------|-------|-------|
| Edge (acres)     | 6410  | 6320  | 6355  | 6156  | 6722  |
| Interior (acres) | 5223  | 5295  | 5354  | 5643  | 5690  |
| Edge/interior    | 1.23  | 1.19  | 1.18  | 1.09  | 0.84  |

## Distribution of Forested Acres and Important Habitats

Part of the concern over wildlife viability on the Tongass stems from the fact there is a disproportionate amount of harvesting planned within high-volume low-elevation stands - areas that also provide critical wildlife habitat and are the most valuable to several species of concern (Suring et.al. 1993b). Logging in the past has targeted these same high volume stands (Iverson et al. 1996). All forested acres are not created equal when taking wildlife into consideration, therefore we felt that it was important in our analysis to look at the effect of each alternative on low-elevation, high-volume stands.

### Effects on Important Habitats

On the Tongass National Forest there is approximately 2.2 million acres of high volume, 2.2 million acres of mid volume and .6 million acres of low volume (USDA 1996). In the Canal Hoya project area there is approximately 676 acres of high volume, 4,496 acres of mid volume and 7,251 acres of low volume. High volume stands make up a small proportion of the project area landscape. Most of the high volume acres occur within the Hoya drainage along Hoya creek. High volume units include 9 (small section) 21 and 33. Alternatives 1, 2 and 3 harvest the highest number of high volume acres (Table 3-16). Alternative 4 harvests substantially fewer high volume acres.

Table 3-16  
Acres of High Volume Removed by Alternative

| Alternative | Acres removed | Units with High Volume |
|-------------|---------------|------------------------|
| 1           | 34            | 9, 21                  |
| 2           | 34            | 9, 21                  |
| 3           | 34            | 9, 21                  |
| 4           | 0             |                        |

### Total acres of high volume = 676

Landscape position is another important component of a wildlife habitat analysis. Important landscape positions for wildlife include the beach/estuary fringe, riparian areas and forested habitats below 800 feet in elevation (USDA 1997a). 1,395 acres of med-high volume (>20,000 bf/acre), low elevation (<800'), low slope (<30%) old growth habitat exists in our project area (Table 3-20 under goshawk section). Many low-elevation areas with large-diameter trees in Hoya are protected within floodplain buffers. There is little change (3-8 acres) between alternatives in the loss of these habitats (Table 3-20: goshawk section). Figure 3-32 displays the location of these stands and other unique habitats in the area.

Two beaver ponds have been identified - one in Canal and one in Hoya (Figure 3-32). A beaver was observed near the Hoya pond and beaver activity enhances the floodplain qualities of the area. Old beaver sign was also observed in upper Hoya and in Canal. Bird surveys in these areas indicate high use by old growth dependent species such as the Brown Creeper and



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Hairy Woodpecker. We reported several rarer bird species within the project area at the Canal beaver pond including: the Lincoln Sparrow and Western Wood Pewee (Incidental bird observations field report 1997). Timber would not be harvested adjacent to the beaver ponds in any alternative.

We have observed a high level of wildlife activity and a high amount of diversity within the Canal and Hoya estuaries. Trails in both estuaries indicate high wildlife use by foraging bears, river otters and mink. Waterfowl, shorebirds, gulls and eagles frequented both areas throughout the summer (see waterfowl discussion, page 3-68). On April 8, 1997 we noted as many as 50 harbor seals in the Hoya estuary presumably feeding on herring.

A few south-facing slopes exist in the project area but many of these slopes occur a great distance from saltwater and may have reduced winter range value for wildlife due to cold interior conditions. Important south-facing slopes for goats exist in upper Hoya and for deer in the southwest corner of the Canal area. We combined habitat capability models with field information to identify habitats believed to be critical to game species (see MIS discussion, page 3-70).

#### Vertical Diversity and Retention

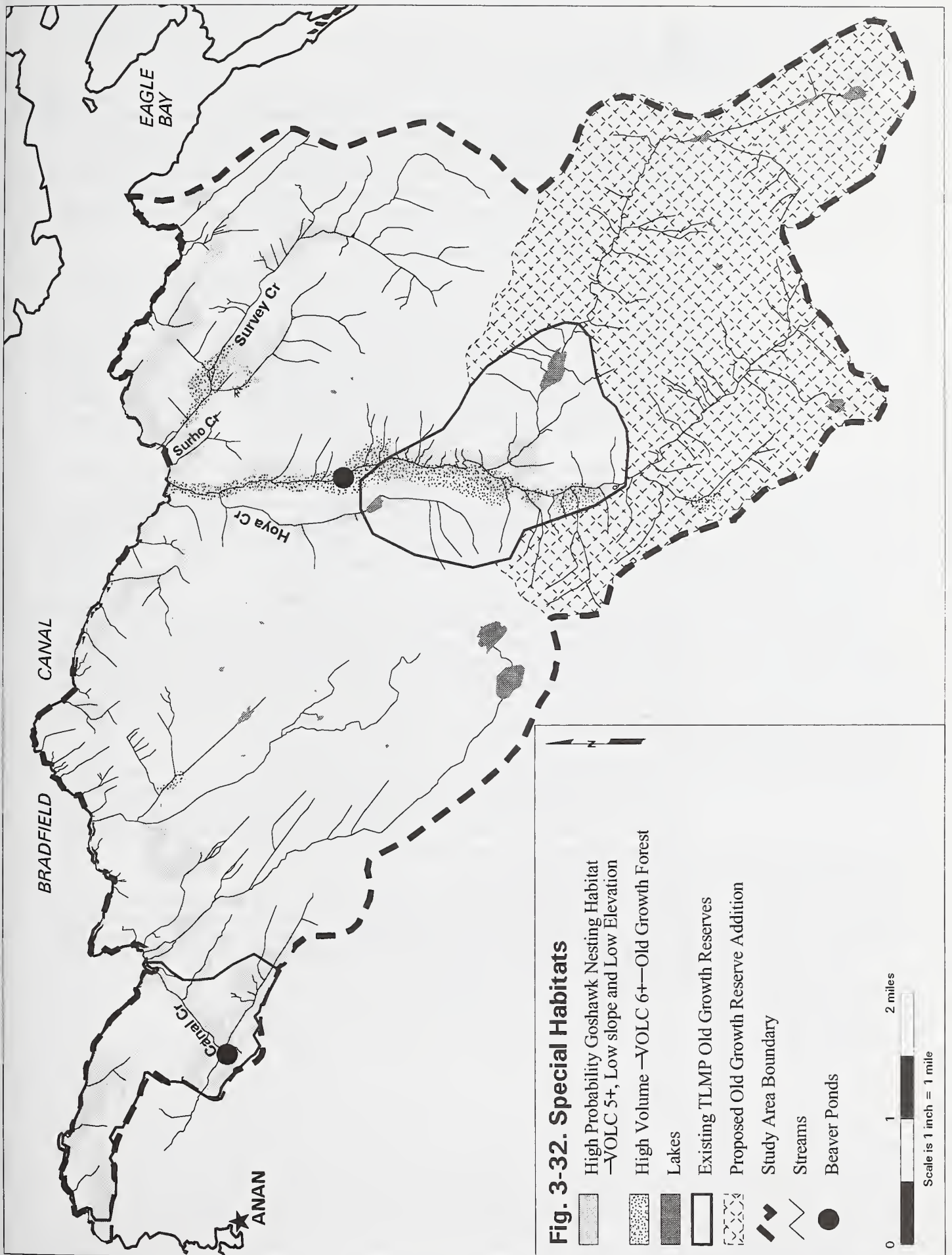
High vertical diversity within a stand generally leads to high animal diversity due to an increase in niche space. Vertical diversity increases as a stand goes through the various stages of forest succession. Stands with trees all of the same age have only one canopy layer and low vertical diversity. Stands with multiple layers (i.e. overstory, midstory, understory, snags, etc.) have high vertical diversity.

Oliver (1990) describes forest succession as follows:

*There are four general stages of forest succession*

- "Stand initiation stage: After a disturbance, new individuals and species continue to appear for several years. Stands developing after major disturbances have been described as 'even-aged' stands, since all component trees have been assumed to regenerate shortly after the disturbance. In fact, trees may continue to regenerate for several decades where growth is slow before the available growing space becomes reoccupied.
- Stem exclusion stage. After several years, new individuals do not appear and some of the existing ones die. The surviving ones grow larger and express differences in height and diameter; first one species and then another may appear to dominate the stand.
- Understory reinitiation stage. Later, forest floor herbs and shrubs and advance regeneration again appear and survive in the understory, although they grow very little.
- Old growth stage. Much later, overstory trees die in an irregular fashion, and some of the understory trees begin growing to the overstory.

These stages will be used to describe the changes occurring within stands as a result of natural and man-made disturbances throughout this report. The majority of the forested landscape in Canal Hoya exists in an old growth stage with a high amount of vertical diversity.



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The positive and negative aspects of each of the successional stage for wildlife depends on the species considered. Following clearcutting, a forested stand will offer some benefits to wildlife while in the stem initiation phase by providing forage. However, the quality of forage within clearcuts is lower than that which occurs within smaller openings (Hanley et. al. 1989). When a stand reaches the stem exclusion phase in 15 to 25 years its benefits to wildlife drop dramatically and may remain poor for 140 years or more. Wildlife population increases caused by logging may be expected to decline as second-growth stands enter the phase of least forage production (Meehan, 1974).

Most wildlife species will respond positively to retention of trees within units although it is difficult to measure this response. We know deer utilize habitats where forage production remains even if portions of the overstory have been removed, either through natural occurrences (i.e. windthrow) or harvest activities. On the Thomas Bay project area, deer and moose use have increased in partially cut units. “Both deer and moose showed similar trends in spring pellet-group counts with the lowest densities occurring in the old growth controls and the highest densities occurring in the 40 percent partial harvest” (Doerr, 1995). Marten, however, will reduce use in areas with more than 70 percent of the overstory removed and will not cross clear areas greater than 100 feet (Ruggiero 1994).

Desirable wildlife trees can be retained by feathering a forest edge with selective harvests along the unit boundary. Feathering will channel wind above the forest canopy, thus lessening the chance of substantial losses due to windthrow. In addition, Ratti and Reese (1988) found that feathered edges result in lower predation rates on interior wildlife species than areas of abrupt edge. Desirable wildlife trees can also be retained within unit boundaries by creating reserves or through diameter-limit prescriptions.

Snags are another important habitat component for cavity nesting birds and mammals. Snags are dead trees at least 15 inches in diameter at breast height and 10 feet in height or higher (Reserve Tree Selection Guidelines R10-MB-215, 1993). Snags, especially broken-top spruce, are extremely important to wintering resident birds. Snags provide important marten den sites (Spencer, 1987). Marten use the tops of broken snags as resting sites in the summer and cavities in winter and summer. Large down logs are another important habitat feature. Marten use the spaces under the snow below the edges of large logs for hunting and travel routes.

The greatest concern relating to snag use in the Canal Hoya project area is for denning bears. (See Anan issue) Black bears in Southeast Alaska appear to show an unusual preference for tree dens. 25 dens were aerially located in Canal Hoya through a radio-telemetry study of the Anan bears. We located the majority of these dens in low volume forest. Seven dens were located during the course of our field work- all of these were tree dens.

#### **Effects on Vertical Diversity**

Alternative 4 has the highest level of retention within units. All units in all alternatives provide alternatives to clearcutting. Clearcut prescriptions for this sale would leave 10% of the acreage of the unit as reserves. Diameter-limit prescriptions would leave a younger age component within the stand. In a few units we would apply an upper diameter-limit which would retain large trees.



## Corridors

Low elevation passes, beach fringe and stream corridors provide natural connections between forested blocks and are important areas for migratory wildlife species. These areas can become “pinch-points” to wildlife species if they provide the only migratory route between two blocks of forest. Corridors can be protected by not harvesting within them or by managing the matrix of habitat between the reserves (Suring et. al. 1993b). Under the Forest Plan, maintaining forested corridors between old growth reserves is a key component to maintaining viable wildlife populations on the Tongass since the majority of the habitat matrix between the reserves is scheduled to be harvested (USDA 1997a). We also looked closely at forested corridors below the powerline since these could also be pinchpoints and important to small mammal dispersal. (Figure 3-33)

The beach fringe is believed to be important as a wildlife travel corridor, as a transition zone between interior forest and salt water influences, and as a unique habitat (or micro-climate). The beach fringe provides important low-elevation connectivity between watersheds that are separated by very steep sides and non-forested ridgetops. In conjunction with riparian areas, which provide connectivity within watersheds, the beach fringe is a component of the major travel corridor system used by many resident wildlife species. The beach fringe is also thought to provide important avian migratory habitat, particularly for neotropical migrants. (USDA 1997a).

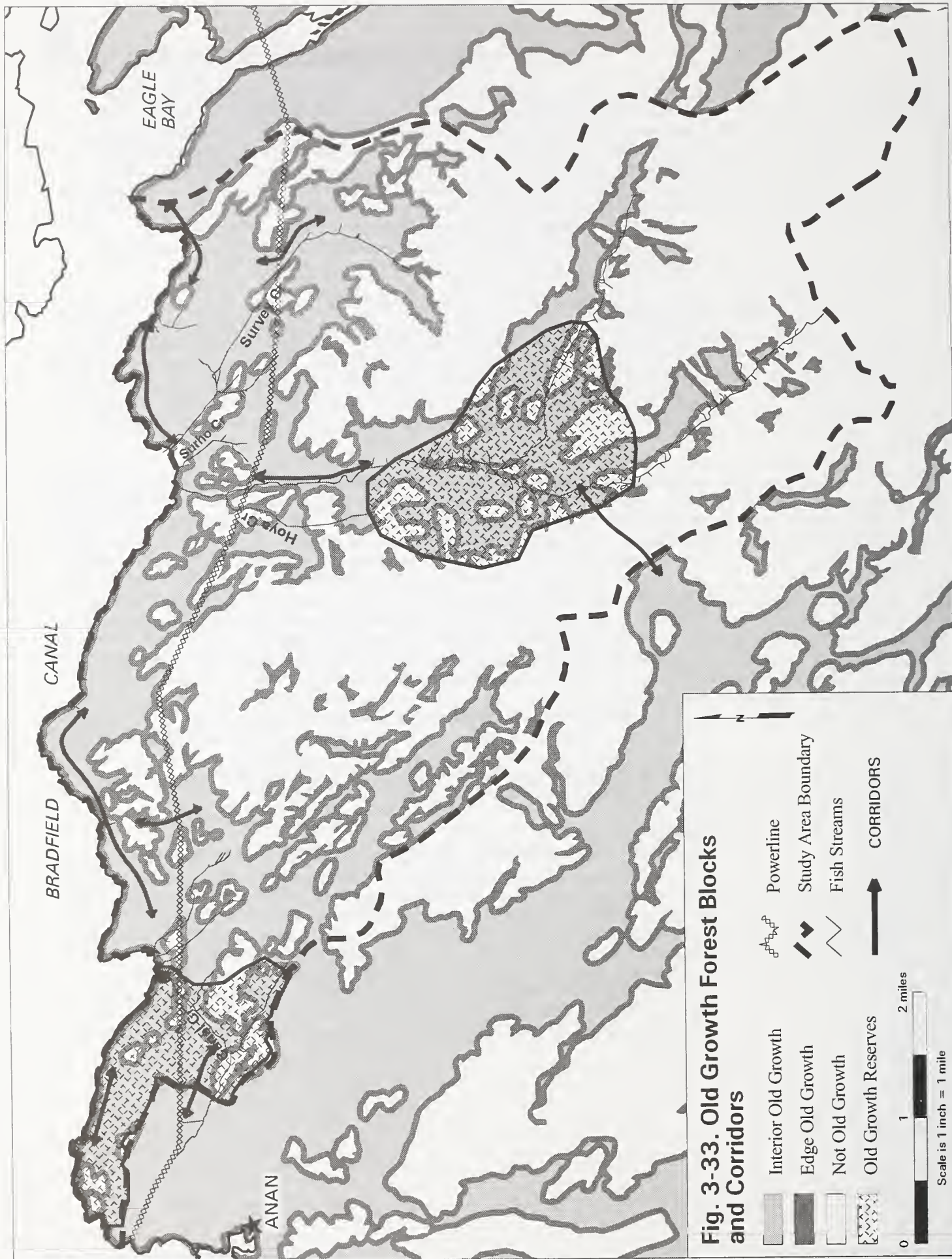
Extensive north/south ridge systems limit the number of east/west corridors available in Canal Hoya. The beach fringe may be the most important and well used east/west travel corridor for this area and is marked by extensive game trails. Well used bear trails occur throughout the project area but are note-worthy along Hoya creek, the creeks going into Hoya estuary and in the southern portion of the Canal Old Growth Reserve. A low elevation, partially forested pass extends from Upper Hoya, through the Canal VCU and to the upper East Fork of Anan Creek. The easiest route for animals to move to and from Eagle river is along the beach (Figure 3-33). The only travel corridor that provides a connection between large forested blocks occurs along the beach between Hoya and Eagle river. The only corridor between the Canal and Hoya Old Growth Reserves is along the beach and Hoya creek. Many of the other connections between blocks have been broken with the placement of the power line.

Corridors along slopes allow for the seasonal movement of certain wildlife species between summer and winter range. Although a great many of these exist, several trails were recorded in the proximity of the lake located west of Hoya Creek and in upper Survey creek. The habitat capability models for the mountain goat and deer were utilized to identify other areas believed to be important in seasonal migrations.

### Effects on Corridors

The following Units are adjacent to forested powerline crossings and are potential barriers to wildlife dispersal: 07, 33 and 3.2. Mitigation for these impacts includes retention within the units and stream buffers. Reserves for Unit 107 would be placed to enhance corridor values. Unit 35 in Alternative 1,2 and 3 does not block a corridor but funnels wildlife travel into the adjacent beach buffer. Units 1,2 in Alternatives 1 and 3 restrict the corridor between Eagle and Hoya river to the beach buffer. Units 19,20 and 21 in Alternatives 1,2 and 3 parallel Hoya creek and the corridor between the Old Growth Reserves. Again, these units may reduce the size of the corridor but they do not eliminate it. Alternative 2 has the greatest impact on wildlife dispersal due to the length of road and the size of units in Canal creek drainage. In summary, Alternative 2 has the greatest impact on travel corridors followed by 1,3 and 4.





## Old Growth Reserves

Old growth Reserves are part of a forest-wide strategy to maintain viable wildlife populations and diversity on the Tongass. A system of large (40,000 acres), medium (10,000 acres) and small (1600 acres per 10,000 acre watershed) Old Growth Reserves have been mapped across the Tongass.

Forest Standards and Guidelines direct us to maintain 600 foot wide corridors between all Old Growth Reserves since interactions between wildlife populations is an important component of viability. Panelists reviewing the Forest Plan concluded that reserves by themselves were not enough to maintain viability (USDA 1997a). Other critical factors for retaining wildlife populations include: alternative harvesting, longer rotations and residual trees left in clearcuts to maintain lichens, mosses, fungi and other species (USDA 1997a).

Small Old Growth Reserves are required to be a certain size and contain a certain amount of productive old growth (POG, volume > 8000 bf per acre). The Forest Plan specifies that the size of each reserve must be 16% of the VCU size (average reserve size is 1600 acres). Within each small reserve, half of the acres (8% of the VCU) must exist as Productive Old Growth. Based on these criteria, small reserves were mapped in the Canal and Hoya VCUs at the regional planning level.

Aside from these general criteria, the design of each reserve should be based on the wildlife concerns specific to the area (Iverson, pers. comm). Criteria that are commonly used in designing small reserves include: important deer winter range, probable goshawk nesting habitat, probable murrelet nesting habitat, large forest blocks, rare plant associations and landscape linkages (Iverson, 1996). The northern flying squirrel and the marten were species of concern that were considered in developing standards for the Small Old Growth Reserves (Suring et al. 1993b).

This report will analyze two Old Growth Reserve options for the Canal Hoya area -- one small reserve for each VCU (Figure 3-33). A reserve option, located south of the powerline in the Canal VCU, was dropped from further analysis. We felt that the existing Canal Old Growth Reserve contained the best wildlife habitat within the area and provided greater security for Anan bears. Table 3-17 lists the acres required and the acres that exist within the reserve as mapped. Since the current size of the Hoya Old Growth Reserve is less than specified by Forest Plan guidelines, and the timber to the south is isolated by the reserve, we propose to expand the Hoya Old Growth Reserve to the south in all alternatives, as discussed in Chapter 2 (page 2-3).

**Table 3-17**  
**Size, and Acres of Productive Old Growth (volume > 8,000 bf)**  
**for each Old Growth Reserve**

|  | Acres of<br>Low<br>Volume<br>Strata | Acres of<br>Medium<br>Volume<br>Strata | Acres of<br>High<br>Volume<br>Strata | Total<br>Productive<br>Old Growth | Total<br>Size |
|--|-------------------------------------|--|--------------------------------------|-----------------------------------|---------------|
| <b>*Canal Old Growth Reserve</b>                   | 10                                  | 500                                    | 540                                  | 1050                              | 1260          |
| <b>**Current Hoya Old Growth Reserve</b>           | 70                                  | 480                                    | 1080                                 | 1630                              | 2090          |
| <b>Proposed Hoya Old Growth Reserve Adjustment</b> | 140                                 | 1180                                   | 1420                                 | 2740                              | 9210          |

\* Size requirements for Canal = 1223. POG requirements for Canal = 611

\*\* Size requirements for Hoya = 2901. POG requirements for Hoya = 1450



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## Canal Old Growth Reserve

Bears were a key component in designing the Canal Old Growth Reserve due to the proximity of the Anan wildlife observatory (see Anan issue, page 3-33). Several radio-collared Anan bears were relocated within this reserve as well as a number of den sites. During the course of our field work we documented numerous well-used bear trails, lots of scat, beds, dens and scratching posts within this reserve -- indicating that this is an area well-used by the local bear population. Corridors between the Canal area and Anan exist along the southern boundary of the reserve and within the beach buffer. The location of this reserve provides a buffer between the Anan bears and the impacts of timber disturbance. Human-bear encounters often lead to increased bear mortality which in turn can reduce the overall density of bears (see Anan issue).

Other considerations in the design of this reserves included: deer winter range, large medium volume forested stands, a resident fish stream and unique habitats (beaver pond/wetland). This reserve contains much of the important deer winter range within the Canal area. Most of the deer sign we observed in 1994-1996 was along Canal creek and in nearby stands. Two large medium volume forested blocks exist within the reserve which provide optimal habitat for nesting goshawks and murrelets (Figure 3-33). The forested stands adjacent to Canal creek, which follows the east boundary of the reserve, contain important habitat values for furbearers such as mink and marten. The beaver pond area (discussed under special habitats) is a unique habitat type for the project area and its inclusion within the reserve gives added benefit to songbirds and waterfowl as well as other species.

## Hoya Old Growth Reserve

The mountain goat was an important species in the design of the Hoya reserve. We received several questions from the public concerning how improved hunting access would impact the local goat population. The Hoya reserve includes all acres of important high value goat winter range within the project area. The location of this reserve also eliminates the need for the construction of a road (and increased) access along Hoya creek. The Hoya reserve prevents the disturbance of seasonal travel corridors between goat summering and wintering areas and between the east and west side of Hoya creek. Nearly all of our goat observations in the past have been within this reserve.

Bears, wolves, waterfowl and furbearers will benefit from the placement of the Hoya reserve. We reported bear sign throughout the reserve and a well-used corridor along Hoya creek. On one Fall flight we observed three black bears in these alpine habitats indicating that denning habitat may be close by. Wolf sign has been observed on several occasions especially in the area of the southwest landscape corridor. The east branch of Hoya creek contains a wetland complex with unique habitat values and is frequented by geese. The riparian zone of upper Hoya appears to be an area used by nesting geese based on the amount of sign recorded. This same zone provides important habitat for furbearers. There is a forested corridor connecting the Hoya and Canal reserves that extends along Hoya creek and includes the beach buffer.

## Cumulative Effects on Old Growth and Fragmentation

Three percent of the productive old growth within this ecological province was harvested between 1954 and 1995 (USDA 1996). Approximately 94% of the Productive old growth in this province and 90% of the highly productive old growth will remain in 2095 (USDA 1996). For the Cleveland peninsula to the west, 80% of the productive old growth and 82% of the highly productive old growth will remain in 2095. There will be no timber harvesting in the Anan VCU which borders the west or the Eagle River VCU to the east.

Fragmentation within the Canal Hoya project area occurred with the placement of the powerline which parallels the beach. Much of the powerline was cleared and remains extremely difficult to cross. Forested crossings occur along v-notches (see Figure 3-33: corridor section). Timber harvesting would add to these fragmentation effects.

## Species Conservation

### Threatened and Endangered Species

Biological Assessments were written to evaluate the effects of the proposed action on federally-listed threatened or endangered species. The Biological Assessments were submitted to the Fish and Wildlife Service for the American peregrine falcon and to the National Marine Fisheries Service for the humpback whale and Steller's sea lion. Both agencies concurred with the findings of no significant adverse effects to these listed species. Consultation with the Fish and Wildlife Service and National Marine Fisheries Service during preparation of this document identified no inventoried resident threatened or endangered species in the project area. The American peregrine falcon passes through the Forest during spring and fall migration flights but is not known to occur on the area.

Biological Evaluations (B.E.) are completed for any project that has the potential to affect a regionally listed sensitive plant or animal species. Biologists provide written documentation in Biological Evaluations of their judgments about whether or not a proposed management action will increase the likelihood of sensitive species becoming threatened or endangered. Peale's peregrine falcon, osprey, Queen Charlotte goshawk, and trumpeter swan have been classified as sensitive species on the Tongass National Forest and may occur in the study area. Only the goshawk is expected to occur in the project area for extended periods of time.

### Species of Concern

#### Northern Goshawk

The northern goshawk (*Accipiter gentilis atricapillus* and *A.g. laingi*) is an old growth associated raptor of special concern on the Tongass National Forest and a key species for the viability assessment of the new Forest Plan (Iverson et al. 1996, USDA 1997a). In 1994 the USFWS received a petition to list the Queen Charlotte Goshawk pursuant to the Endangered Species Act (ESA). The USFWS made a second decision to not list the goshawk in 1997 based on protection measures outlined in the Forest Plan.

The Queen Charlotte Goshawk (*A.g. laingi*) is a subspecies of the goshawk with a northern range extending to the Taku River in southeast Alaska. Eighty-one percent of the confirmed and probable nest sites of this subspecies in southeast Alaska are south of Frederick Sound (Queen Charlotte Goshawk Statue Report for R10 Sensitive Species Consideration, USDA, 1991). A portion if not all of the goshawks in Southeast Alaska are believed to belong to the Queen Charlotte subspecies (Iverson et al. 1996).

Concern for the goshawk stems from the reductions in preferred habitat. "The amount of habitats used and selected by goshawks for nesting and foraging, and most likely important habitats for principal prey species, have declined in the past and continue to decline under current management" (Iverson et al. 1996). Goshawk densities are low in Southeast Alaska with less than 40 nest sites identified after five years of inventory across the Forest (USDA 1997a). Large home ranges, nonbreeding and differential winter and breeding areas may be indicators of ecological stress in Southeast Alaskan goshawks.

Goshawks make extensive use of productive old growth forests for foraging and nesting. Based on radio-telemetry studies of goshawks on the Tongass, 70.5 percent of goshawk habitat use occurred in mature sawtimber or productive old growth forest (Iverson et al. 1996). Titus et al (1994) reported 92% of radio-collared goshawk relocations in productive old growth (volume > 8,000 bf/acre) and only 1% of the relocations in young, second growth forests. Productive old growth forests support a wider range of important prey than do other habitat cover types (Iverson et al. 1996). At least 600 acres of nesting habitat (Productive Old Growth) is desirable within each 10,000- 30,000 acre watershed (USDA 1997a).

Landscape factors such as slope and elevation along with beaches, riparian and estuaries are important to goshawk habitat suitability. Goshawks appear to prefer low elevations (less than 800') and gentle slopes (less than 35%, Iverson et al. 1996). We used this information to



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determine acres of suitable nesting habitat within the project area (Table 3-18). Riparian zones ranked as the most important landscape component by radio-marked goshawks (Iverson et al. 1996). Telemetry results also indicate extensive goshawk use within the 1000 feet of beaches and estuaries (Titus, ADFG, unpubl. data). Beach, estuary and riparian habitats generally support greater prey diversity and net prey productivity, features important to goshawk habitat quality (USDA 1997a).

There is a great deal of variation in goshawk home range estimates and seasonal movements. Crocker-Bedford (1990) estimates home range acres to vary between 6000 and 8000 acres. Iverson et al (1996) reports female and male use areas to range from 9,469 to 11,425 acres. Current standards direct the Forest Service to “maintain an area of not less than 100 acres of Productive Old Growth generally centered around the nest tree” (USDA 1997a).

Due to the extreme difficulty in finding nests, management for goshawks must take a dynamic landscape approach. Recommendations for maintaining goshawk viability include maintaining 1/3 of the landscape in 0-100 year old stands, 1/3 in 100-200 year old stands, and 1/3 in 200-300 or older stands (high value). This is based on a 300 year rotation disturbance regime which mimics the natural condition of the landscape by providing foraging and nesting areas (Iverson et al. 1996).

Alternative harvesting methods may also offer options for goshawk protection. Management of the landscape matrix was viewed as more important than habitat reserves by the scientific panel reviewing the Forest Plan and roads may not decrease habitat suitability. Group selection harvests of 1-2 acres (3.3% of a stand in any decade) are believed to maintain medium to high habitat values for nesting and foraging goshawks (Iverson et al 1996).

Broadcast surveys were completed on 121 points in portions of the Canal Hoya project area in 1994 and 1996, following the Regional protocols for the northern goshawk. Surveys in 1994 were conducted before harvest units had been designed and focused on high probability stands. 90% of the high probability units in Canal Hoya were surveyed in 1996. Courtship surveys were completed during April of 1996 and 1997. One individual was observed flying over the Bradfield Canal during these surveys but was not engaged in courtship behavior.

#### Effects on Northern Goshawks

We do not expect a significant impact on goshawk populations as a result of this sale due to the amount of habitat that would remain after the sale. At the biogeographic scale, the North Misty Fjords province is not an area of high risk for the persistence of goshawk populations before the year 2055 (Iverson et al). On a finer-scale, this Stikine Management Area does not exceed the 33% landscape timber harvest level by 2055, which can result in goshawk population impacts (Iverson et al.) The steep rugged terrain with the Canal Hoya project area may be less suitable for nesting goshawks than the habitat found on nearby islands (Cole Crocker Bedford, pers. comm). There is an insignificant difference in the acres of suitable goshawk habitat removed by each alternative (Table 3-18). If we expand our habitat definition to include low volume forest, Alternative 1 removes 33-55 more acres of low-elevation, low-slope habitats than the other alternatives. This is largely due to the size of unit 35 in Canal and unit 47. Alternative 1 also results in the greatest amount of fragmentation.



Table 3-18  
**Acres of Medium - High Volume (>20,000 bf/acre),  
 Low Elevation (<800'),  
 Low Slope (<30%) forested habitat  
 and % Remaining by Alternative**

| Important<br>Goshawk<br>Habitat | Alt 1 | Alt 2 | Alt 3 | Alt 4 | Alt 5 |
|---------------------------------|-------|-------|-------|-------|-------|
| Acres existing                  | 1325  | 1308  | 1308  | 1323  | 1,395 |
| Percent remaining               | 95    | 94    | 94    | 95    | 100   |

### Marbled Murrelet

The marbled murrelet is a small seabird with black and white winter plumage that is found throughout the North Pacific. Murrelets feed on small fish and invertebrates in near-shore ocean areas, inland saltwater and occasionally on inland freshwater lakes. Birds are most easily observed during the nonbreeding season when they form small flocks. During the breeding season birds are more dispersed but will still concentrate in feeding areas during the day. Murrelets are highly mobile in their search for foraging areas suggesting a high level of population interaction.

Marbled murrelets are listed as a threatened species in Washington, Oregon and California and attention to this special emphasis species is increasing in Alaska. The Forest Plan states "The listing of this species in WA, OR and CA and the reductions in habitat from timber harvesting, have raised concerns for the viability of this species in southeast Alaska (USDA 1997a). Global population trends are considered to be downward for all populations that rely on large, commercially valuable conifers for nesting. Estimates of murrelet numbers in southeast Alaska range from 45,000 to 250,000 (DeGange 1996).

Marbled murrelets generally select old growth stands and large diameter trees as nest sites (Ralph et al. 1995, DeGange 1996). A small percentage (less than 10%) of birds may nest on the ground (DeGange 1996). Large limbs of old growth trees are the preferred area for nest placement. The importance of canopy cover is unclear. High canopy cover within the stand may limit ease of access to the nest. However, high canopy cover at the nest site is believed to contribute to nest success by concealing nests from predators. Therefore, mid-volume stands with large trees may receive a high amount of use. Due to the difficulty in finding nests, marbled murrelet nesting requirements are not well established in southeast Alaska. Tree diameters for two nests discovered on Prince of Wales ranged between 31" dbh to 80" dbh (DeGange 1996). In general, the "best or most important habitat is found within large contiguous blocks of high-volume, low-elevation old growth forest" (USDA 1997a).

The importance of beach and riparian areas is largely unknown. Some researchers have found a preference for riparian corridors indicating that birds may be following stream (openings) to the nest. Three nests discovered on Prince of Wales varied in their distance from saltwater (.3 miles, 3.9 miles, 8.1 miles). One study in southeast Alaska reported the greatest amount of murrelet activity occurring between 1 and 7 km from the coast (DeGange 1996). Riparian and beach fringe buffers, due to their linear nature and high amount of edge, may be less suitable for nesting (USDA 1997a).

There are no nest records of marbled murrelets in the Canal Hoya area. During the 1994 and 1996 field seasons, boat surveys were conducted in high probability areas using a standard protocol for surveying marbled murrelets in forested sites (Field report on murrelets 1997). Field surveys of probable nesting stands did not locate any eggshell fragments. Inland dawn counts were not conducted due to the inability to pinpoint likely nest areas and for safety

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reasons. Due to the fact that murrelets are often completely quiet near the nest; boat surveys may provide as much information as land-based surveys (Marks et. al. 1995).

The Forest Service is directed to protect nesting habitat around identified murrelet nests. This is believed to be a relatively ineffective management strategy given the difficulty in finding nests (DeGange 1996). If a nest site is found, a 600 foot buffer would be maintained around the nest (USDA 1997a). Roads can enter this buffer if unavoidable, but every effort should be made to protect the nest site. Road building and fragmentation of forested areas is believed to increase predation as a result of increased access to marbled murrelet nesting stands by avian predators, especially jays, crows, and ravens (cited in DeGange 1996).

Results of our project surveys did not show a difference in murrelet activity between the two VCUs but most of our initial detections were of birds located north of the project area. An area *north* of the Canal VCU was also identified as a "presumed nesting area" in the Conservation Assessment for marbled murrelets that was completed for the Revised Plan (DeGange 1996). Small boat surveys conducted in 1994 as part of this assessment estimated 0.1-10.0 murrelets per sq. km in the section of the Bradfield adjacent to Hoya creek and 10-25 murrelets per sq. km. in the area adjacent to Canal (DeGange 1996). Based on this Assessment and our project surveys, we believe that much of the murrelet activity on the Bradfield Canal occurs north of the Canal and Hoya VCUs (Murrelet field report 1997).

#### Effects on Marbled Murrelets

The impact of these alternatives on murrelets varies with the location of units, the amount of suitable habitat lost and the level of fragmentation. The Tongass conservation assessment for murrelets recommends developing reserves in low elevation areas that include streams and rivers. In addition, the Forest Plan recommends protection of old growth habitat near the heads of bays especially in aquatic or terrestrial concentration areas. Many of these habitats are protected within the Old Growth Reserves and in beach, estuary and stream buffers. As with goshawks, there is little difference between the acres of suitable habitat removed by alternative (Table 3-18).

It is known that marbled murrelets prefer late-successional forested stands or old growth, with large diameter limbs covered with moss and lichen for nesting areas. With the silvicultural prescriptions used in this Environmental Impact Statement, such trees would be retained to varying degrees in most treatment areas, possibly mitigating many of the effects on murrelet habitat. Murrelets may remain nesting in stands with two-age management systems (10-20% of stand left) and reserves (DeGange 1996).

## **Wolf**

Wolves in southeast Alaska prey on Sitka black-tailed deer, moose, mountain goat, beaver, black bear, spawning salmon and geese. The total population is estimated at fewer than one thousand individuals in all of southeast Alaska with approximately 200 being harvested annually (Kirchhoff 1991). Although wolves are listed as threatened in the contiguous 48 states, they are not listed in Alaska. The commitment of the Forest Service to revise its Tongass Land Management Plan to adequately protect habitat for the Queen Charlotte goshawk and other species associated with old growth forest was an important element in the USFWS decision not to list the wolf in Alaska at this time. Kirchhoff (1991) identified four factors that could place this subspecies at risk:

- Liberal trapping and hunting regulations
- High road densities
- Reduced prey populations in areas subject to intensive logging
- Inbreeding depression within insular populations

Two viability concerns exist for the wolf: 1) the short-term concern involves increased harvest (especially in GMU2 on Prince of Wales Island) and 2) the long-term concern involves large reductions in deer habitat capability (USDA 1997a). The greatest concern over wolf harvesting is in GMU2, north Prince of Wales, where wolf harvests have exceeded 50% of the population in some locales. Wolf harvests have been relatively stable in the last 15 years in GMU 1B however the level of harvesting is high (27% of the population) (Kirchhoff 1991). Exceeding this level of harvest may result in a population decline (Kirchhoff 1991).

Roads increase the risk to wolf viability due to the high level of hunting, trapping and poaching that occurs along roads. Of the wolves killed in GMU 2 since 1985, 46% were either shot or trapped along the road system (cited in Kirchhoff 1993). Kirchhoff (1993) and Pletscher (1994) recommend a road density threshold of no more than 1 mile of open road/square mile. Education and management of roads is an important component of a wolf conservation strategy. Current hunting and trapping of wolves in this area is low with only one animal harvested in the last 9 years (ADFG harvest report 1997).

Deer habitat capability is believed to be the most significant factor effecting the viability of wolves. Deer capability of WAAs should be greater than 4.0 deer per km<sup>2</sup> (10 deer/mi<sup>2</sup>) (Kirchhoff 1991). The Forest Plan predicts a reduction in deer density for this WAA in the year 2095 from 15 deer/sq mile to 14 deer/square mile as a result of timber harvesting. However, ADFG reports that deer populations in this area are probably below habitat capability and that "habitat capability is so low... that viability of the deer population could be in question if any habitat were to be lost" (ADFG 1991).

The Canal Hoya timber sale area covers approximately 60 square miles. This size area is probably frequented by 1-2 packs. Sign was observed throughout the project area. Sign was noted for a high proportion of the stand surveys that occurred along the beach fringe which indicates that this is a well used corridor. Animals were observed on a few occasions along the beach. We also noted use within the upper Hoya corridor area (see Figure 3-33, corridor map). Scat in the project area appeared to contain a mixture of deer and goat hair. (Field report on wolves 1997).

## **Effects on Wolves**

The effect of this timber sale to the wolf population is displayed by analyzing the impact to the deer population and the level of roading by alternative. Predicted increases in wolf harvest would vary according to the number of road miles and post-harvest management planned for the roads in the various alternatives. The alternatives with the most miles of road would have the greatest potential to increase wolf harvest since hunting access at this time is restricted to the shoreline. Road closures would reduce the potential wolf harvest; however, we anticipate that most of the potential harvest would be incidental take by people hunting other game species, and even closed roads provide walking corridors that would be used by



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increasing numbers of hunters. Alternative 2 has 4-11 more miles of road than the other alternatives. Alternatives 1, 2 and 3 retain 92-94% of existing deer winter range habitat capability (Table 3-22, MIS section). Alternative 4 has fewer roads and retains more of the existing deer winter range than Alternatives 1, 2 and 3. Alternative 2 would have the greatest impact on wolves followed by Alternatives 1, 3, 4 and 5.

#### **Waterfowl and Shorebirds**

Important areas for waterfowl in Canal Hoya include estuaries, streams, lakes and beaver ponds (see special habitats discussion, page 3-55). We recorded eight waterfowl species in the project area during the course of our field work (Field report on waterbirds 1997). No important molting or waterfowl concentration areas were found in muskeg or beaver pond habitats. We observed small flocks of birds, Barrow's goldeneye and Canada geese in both estuaries during migration.

Vancouver Canada Geese are distributed throughout SE Alaska with an estimated population of 10,000 in northern SE. The Vancouver Canada Goose is a Management Indicator Species that uses forested and nonforested wetlands in the estuary, riparian and upland areas of the forest (USDA 1997a). Geese were observed displaying territorial behavior at two lakes within the Hoya VCU. Harlequin ducks nest along streams and were formerly a candidate species for listing under the Endangered Species Act. Harlequin ducks have been observed near the Hoya estuary but always in small flocks (8-20 birds). We saw no evidence of nesting activity, i.e. young birds or pairs, by Harlequin ducks.

Shorebirds were observed along the beach and estuaries and in muskegs. Greater yellowlegs and Spotted sandpipers are the only species that appear to breed in the project area. We have seen no evidence of use by large flocks of migrating shorebirds.

#### **Effects on Waterfowl and Shorebirds**

The riparian, beach and estuary buffers protect habitat for waterfowl such as harlequin ducks and Vancouver Canada Geese. The estuary buffer zones and placement of LTFs away from the estuaries should minimize most of the effects of timber harvest on waterfowl. The wetlands that would be affected by roads do not appear to be of significant importance to large numbers of waterfowl.

#### **Amphibians**

We spent seven days conducting intensive amphibian surveys within the project area. The spotted frog has been identified as a species of concern by the USFWS and was formerly a candidate species for listing under the Endangered Species Act. During field evaluations, no spotted frogs were found. There are no historical records of spotted frogs in this area (Hodge 1976). Rough-skinned newts and Boreal toads were observed in a few of the muskeg wetlands. One of these wetlands is close to the LTF and sortyard in Hoya. If spotted frogs are found, their locations will be documented and a management decision will be made for the correct course of action. The processes outlined by the Endangered Species Act of 1973 will be followed if the spotted frog, a special concern species, is listed by the Fish and Wildlife Service for protection. Amphibian populations may be low in this area as a result of extreme weather conditions and lack of dispersal corridors. Beach, estuary and stream buffers as well as wetlands habitat protection would reduce the impacts of this sale on amphibians.

## **Songbirds**

We recorded 54 bird species during incidental wildlife observations and songbird censuses (Field Report on incidental bird observations 1997). Sixteen species and 144 individuals were detected during songbird point counts in the project area in 1996 (Field report on NTMB 1996). Twenty of the species we detected are classified as neotropical migrants - birds that winter in the southern U.S., Central and South America. We frequently observed Chestnut-backed chickadees and Pacific-slope flycatchers -- two species of high priority in Alaska (Brad Andres, pers. comm.). The Red Crossbill also ranked as one of the most commonly observed species. Crossbill numbers were high throughout the region in 1996 (Armstrong, pers. comm.). We reported five other high priority species in relatively low numbers: Red-breasted sapsucker, Rufous hummingbird, Golden-crowned kinglet, Townsend's warbler and Ruby-crowned kinglet.

All three of the songbird Management Indicator Species were reported as incidental observations during non-census hours: Hairy Woodpecker, Brown Creeper and Red-breasted Sapsucker. Brown creepers depend on old growth forest conditions for nesting. On several occasions we noted Brown creepers as well as the other two MIS utilizing beach/estuary and stream buffered habitats. Brown creepers appear to be breeding in Hoya units 27, 19, 23 and 06 and in Canal unit 48. A Red-breasted Sapsucker nest with young was located and marked along a proposed road location in Canal.

## **Effects on Songbirds**

Maintaining old growth habitat for songbirds varies by each alternative based on the level of harvest and the degree of fragmentation. Beach, estuary and riparian habitats -- important areas for songbirds -- would be retained under all alternatives. Alternatives 1 and 2 would have the greatest impact on songbirds as a result of forested acres harvested and fragmentation. More forested acres remain with Alternative 4 as well as vegetative structure within the harvest units. Alternative 4 results in the least amount of fragmentation.

## **Eagles and Other Raptors**

The Forest Plan calls for a 600-foot windfirm buffer around active raptor nests. The only raptor nest that has been located in the project area is near Unit 25 in Hoya which has been redesigned to meet this standard. We have noted merlins, sharp-shinned hawks and pygmy owls in the area west of the Hoya LTF and within the beach buffer but no nest has been located. Owls (Pygmy or Saw-whet) were heard calling within the Hoya Old Growth Reserve in 1994. We completed 121 goshawk survey points within the project area but did not discover any breeding birds (Field report on incidental bird observations 1997).

In 1989, nine eagle nests were mapped within the project area by the USFWS. Several of these nests were inactive in 1997 or had blown down. Five of the nine nests occur within the beach buffer in the Canal Old Growth Reserve. The USFWS and the Forest Service maintain an interagency agreement for bald eagle habitat management in the Alaska Region. All identified nests are surrounded by a 330 foot radius protective management zone. Helicopter activities for this sale would be restricted within 1/4 mile of active eagle nests.

## **Effects on Eagles and Other Raptors**

The mitigation measures discussed and the habitat protected within beach, estuary and stream buffers would reduce the impact of all alternatives on raptors.

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## Management Indicator Species

## Management Indicator Species Analysis

Management Indicator Species (MIS) are vertebrate or invertebrate species whose response to land management activities is used to predict the likely response of other species with similar habitat requirements. These species are termed indicator species due to their importance to the ecosystem and humans, and as an indicator of habitat quality. A species selected as an indicator may be threatened or endangered; commonly hunted, fished or trapped; or a non-game species of special interest. Taking a look at the MIS in an area is consistent with the National Forest Management Act that requires that management indicator species be identified for each national forest and be used for environmental analysis.

Habitat needs of many of the MIS are accounted for with the beach/estuary and stream buffers. The highest habitat suitability values for bald eagles, marten and river otter were assigned to the beach fringe (Suring 1993b). The beach fringe ranked second only to the 1000' estuary fringe for brown and black bears in overall habitat quality, and higher deer habitat values generally occur in high-volume old growth below 800' elevation. (USDA 1997a).

### *Habitat Capability Models are used for Management Indicator Species*

Analyzing the effects of an action on MIS has traditionally involved using habitat capability models. The Forest Plan points out the problems with the MIS approach and points to the importance of "coarse-filter approach" or look at overall impacts to the old growth ecosystem (such as is being done in this analysis with goshawk habitat and road density). The use of MIS to represent the needs of other species is highly questioned since "there is no assurance that all or even most other old-growth associated species have similar needs" (USDA 1997a). Productive old growth stands older than 200 years with a volume of 8,000 board feet per acre provide essentially all of the highly-important habitats for MIS (USDA 1997a). As a result, the Forest Plan limits the use of habitat capability models to deer.

Even given the problems with the MIS approach, we believed that a close look at the habitat capability models for a few species in Canal Hoya would provide another useful measure of effects. The results of our habitat capability models are presented for the mountain goat, deer and marten. Bald eagle and otter were not chosen as MIS because management activities would have little effect on their habitat given the estuary, beach and riparian buffers. The results of habitat capability modeling for brown and black bear are discussed under the Anan bear section.

The ability of the project area to support the selected indicator species was analyzed using a Geographic Information System (GIS) and computer habitat capability models developed for the Tongass Forest Plan revision effort. Habitat suitability analyses were performed on TIMTYP modified with field information on volume. Due to model limitations, and to allow for the possibility of natural events such as blowdown in partial cut units, we modeled all harvest activity as a clearcut. Thus, the reductions listed here are used as a "worst case scenario". We predict that there would be greater use of partial cuts by Management Indicator Species than of clearcuts, so we expect less impact under the unevenaged prescriptions than have been modeled here.

In use of The Model for alternative comparison, habitat "scores" produced by the models are often linked to the carrying capacity of a species for purposes such as a subsistence analysis. However, the ability of Habitat Capability models to predict animal populations has been highly criticized. To understand the effect of habitat changes on populations, Habitat Capability scores need to be linked to mortality, natality, habitat patch size, emigration and immigration estimates. Furthermore, to predict a future population, information on the population's current density and age and sex composition is also required. In short, we are unable to predict wildlife populations into the future, except in the most general of terms.



Wildlife habitat capability models, are best suited for comparison of habitat availability between alternative land management proposals. Habitat Capability models assign values to habitats and should be viewed as an index of risk used to rank planning alternatives. In other words, the statement "of the five alternatives, Alternative 1 has the highest habitat capability score" is believed to be more accurate than the statement "the model predicts a habitat capable of supporting 324 animals in Alternative 1". The first statement implies that habitat features associated with animal use would be more abundant in Alternative 1.

Models used as a tool for management decisions are important. They should be recognized as only one of several sources in the analysis process to identify specific project effects. Knowledge concerning each species and their various habitat needs improves with field validation over time and adds to the reliability of model predictions.

## **Mountain Goat**

The mountain goat is considered an old growth associate that is generally associated with steep slopes and cliff habitat, areas generally inoperable for timber. The quantity and quality of winter habitat is the most limiting factor for mountain goats in SE Alaska. Old growth trees with large dense crowns intercept the most snow thus providing understory forage during hard winters. The most recent version of the goat habitat capability model shows important habitat to generally be productive old-growth forest within 1,300 feet of escape terrain (>50% slope or cliff). Travel corridors between seasonal sites are important and should be maintained (USDA 1997a).

Goats are sensitive to disturbance that results from human developments and activities. The Forest Plan requires the Forest Service to locate camps, LTFs, facilities and other developments 1 mile or more from important wintering and kidding areas. Goats can be disturbed by low-level aircraft flights over alpine habitats (USDA 1997a). "Forest Service permitted or approved aircraft flights, including helicopter yarding of timber, should maintain a 1,500 foot vertical or horizontal clearance from traditional summer and kidding habitat and animals whenever feasible. Where feasible, flight paths should avoid known mountain goat kidding areas from May 15 through June 15. Pilots will not compromise safety."

Field surveys in 1996 and in previous years provided us with the information we needed to address goat habitat security (Field Report on Mountain goats 1997). Important areas occur throughout the upper Hoya drainage. The Hoya Old Growth Reserve contains or isolates all of the high value habitat we identified using the goat Habitat Capability model (Figure 3-34). Most of our visual reports of goats have been in this same area. Goats appear to occasionally use the cliffs west of Hoya creek and parallel to the beach. We have also seen sign and animals in the area of Upper Survey creek. No important habitat areas have been identified in the Canal VCU due to lack of escape cover.

Harvest data is collected by the ADFG using a geographic division called the Wildlife Analysis Area (WAA). On average, one goat is harvested per year within this WAA which covers the Canal, Hoya and Eagle river drainages (ADFG harvest report 1997). ADFG (1992) suggests that mountain goat populations are stable to slightly increasing for all of GMU 1B.

## **Effects on Goats**

The loss of high value habitats for MIS varies by alternative and by the species considered. Alternatives 2 and 3 have the biggest indirect effect on goat habitat due to the segment of road in upper Survey creek (Figure 3-34, Tables 3-21 and 3-22). However, most winter hunting of goat populations occurs along the beach and it is highly unlikely that hunters would travel 4-5 miles to access the patch of interior habitat that the model predicts would be impacted. Hunters would have easier access to the alpine area above this patch of high value wintering habitat in Alternatives 2 and 3. Alternatives 1, 2 and 3 all construct a segment of road west of Hoya creek which would provide much easier access to goat populations than is afforded by no action. Mitigation to reduce this impact would require removing the Hoya creek bridge.

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Many hunters prefer to access hunting areas by vehicle. We would mitigate the effect of improved access by gating the road. Harvest units that are in close proximity to goat wintering and summering areas include units 4-7 in Upper Survey Creek and Units 19,22,23 and 24. The percent of overall habitat capability remaining under any alternative is greater than 87% (Table 3-22). Alternatives 2 and 3 would have the greatest impact on local goat populations followed by Alternatives 1 and 4.

#### Deer

Under intermediate and deep snow conditions, deer will select those habitats that provide for snow interception and food availability. The combination of a dense canopy with scattered openings in old growth forest types allows forage growth under openings while the canopy modifies snowfall sufficiently to promote forage availability and movement of deer. The nutritional value of plants grown in partial shade is also higher than that of plants grown in full sunlight (Hanley et. al. 1989). Timber harvesting of old growth can lead to reductions in deer wintering habitat. Fragmentation of these habitats may also lead to changes in population distribution. Predator search time is reduced when deer are forced to concentrate into smaller, predictable blocks of cover (Suring et. al. 1992).

The revised deer habitat model assigns optimal values to higher volume old-growth stands on south-facing slopes at lower elevations in watersheds with low propensity for deep snow (Figure 3-35). Clearcuts receive low scores in high snow areas such as the mainland but group selection units (10% of a 100 acre stand) provide moderate habitat conditions for deer. Variables important in the deer model include: volume (high, medium, low, other), post-harvest types, snow accumulation, elevation and aspect. Wolves also have an effect on deer populations. There are no group selection prescriptions for our project area and there are no "low snow" zones which contain suitable wintering habitats for deer.

In general, we examine changes in habitat capability and not actual on the ground numbers, which for any given time period are likely to be below, or occasionally above the population estimates of the habitat capability model. However, for certain species such as deer, we stretch the limits of our models by estimating population numbers in order to answer questions concerning subsistence. The number of deer for this WAA is estimated at 687 in 1995 based on the habitat model.

"Sitka black-tailed deer is by far the most important, and most "harvested" terrestrial wildlife species for subsistence purposes, and for sport hunting (USDA 1997a). Biologists estimate that 10% of the population can be harvested at carrying capacity with the population remaining stable and hunter satisfaction remaining high (Suring et al. 1992). Harvest data is collected by the ADFG using a geographic division called the Wildlife Analysis Area (WAA). The average 8 year harvest for WAA 1814 (Canal, Hoya and Eagle drainage) is 0 (USDA 1997a, ADFG harvest report).

Standards and guidelines in the Forest Plan protect deer winter habitat in the following ways:

- Important deer winter range needs to be identified as a part of project analysis
- We must assure consideration of deer winter range in the environmental analysis process.
- Beach/estuary and riparian buffers are designed to protect important deer winter habitat
- We are directed to maintain sufficient deer habitat to maintain sustainable wolf populations (generally 13 deer/sq mile)

Based on the low level of browse and general lack of sign in the project area we feel that the deer population is relatively low and has been for some time. Wildlife surveys in 1984 reported that deer sign was limited to three areas of Canal. This may be a result of two factors -- high predator density (wolves and bears) and severe winter conditions. Two general areas identified as high value habitat by the model and where we noted sign were the high



volume stands within the Canal Old Growth Reserve, and the floodplain habitat east of Hoya creek (Survey creek).

## Effects On Deer

The Forest Plan predicts a reduction in deer density for this WAA by the year 2095 of 1 deer/sq mile as a result of timber harvesting. Although deer winter habitat loss would occur with this timber sale, many important areas are protected under the Forest Plan. The 1000 foot beach and estuary buffer were established to protect critical deer winter range habitat. Forested stands that appeared to be well used by deer were included within the two Old Growth Reserves. In addition, >80% percent of moderate value deer habitat would remain under any alternative (Table 3-21, no high value habitat exists).

At least 92% of overall habitat capability would be retained with any alternative (Table 3-22). Timber harvest and the closing in of second-growth stands would likely alter deer habitat use patterns. Roads would improve hunting access which could depress this low density population. Harvest units within the Canal area that contain important deer winter range include Units: 35 (close to LTF), 48 and 38. Similar units in Hoya include: 9-10 (Survey creek floodplain), 22 (west of Hoya creek), 112-113, and 106-107 (upper Survey creek). Alternatives 1, 2 and 3 have the biggest impact on moderate value habitats (Table 3-21). Alternative 4 harvests the least amount of deer winter range (other than no action) and provides greater habitat security.

## Marten

Marten are a viability concern species on the Tongass because they are "clearly associated with late seral and old growth forests and ... function ecologically at broad landscape scales" (USDA 1997a). Beach fringe and riparian habitats are believed to be highly important to this species (Figure 3-36). The marten is a broadly ranging species and conifer corridors facilitate movement and dispersal between patches of habitat (USDA 1997a). Optimum forest patch size is 180 acres or more.

Marten are trapped for their fur and populations in southeast Alaska are susceptible to overharvest. ADFG (1991b) reports moderate to high marten populations with numbers decreasing in heavily trapped areas. Studies on Chichagof Island using radio-collared marten demonstrated that marten have a 100% probability of being trapped when their home range intersects road or shoreline (Tom Paul, pers. comm).

As many as 50 marten have been trapped in one season from WAA 1814. Ninety-two marten were trapped in the WAA between 1984 - 1987 (TLMP SDEIS 1991, ADFG harvest report 1997). Results of our habitat capability models indicate that this area could support 62 marten in 1990 (RSDEIS 1991). Forest management activities resulting in increased roading access may increase the potential for overtrapping.

Mitigation measures for marten include extended rotation, retention within units and road closures. Rotations of greater than 100 years were considered important in maintaining viable marten populations. A two-aged management scheme can enhance structural diversity in managed stands, particularly later in the stand development. This improves both marten prey species habitat as well as provide more complex and beneficial structure for marten cover and denning. (USDA 1997a).

## Effects On Marten

The change in existing high value marten habitat for any alternative is less than 10% (Table 3-19). Change in overall habitat capability is less than 6% (Table 3-20). We expect roads to have the biggest impact on martens since current trapping access is restricted to the shoreline. Trapping may have removed 80% or more of the population of this WAA in previous years. Roads constructed with this sale would further increase the trapping pressure on this population. Large tracts of undisturbed old growth would remain after the timber sale within Old Growth Reserves and riparian buffers. These areas would serve as a "source", i.e.



### 3 Environment and Effects

martens would disperse and repopulate areas where they would continue to be trapped (beach and road system). Many hunters prefer to access hunting areas by vehicle. We would mitigate the effect of improved access by gating the road. Alternative 2 would have the greatest impact on marten by constructing more miles of road than other alternatives followed by Alternatives 1 and 3. Alternative 4 would have the least impact on marten (other than no action) due to fewer miles of constructed road and remaining habitat.

Table 3-19  
**Acres of Highly Suitable Habitat for Management Indicator Species  
and Percent Remaining by Alternative**

| Species | Existing<br>acres | %<br>remaining<br>Alt 1 | %<br>remaining<br>Alt 2 | %<br>remaining<br>Alt 3 | %<br>remaining<br>Alt 4 |
|---------|-------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| *Goat   | 436               | 97                      | 45                      | 46                      | 97                      |
| **Deer  | 813               | 82                      | 84                      | 85                      | 94                      |
| Marten  | 7814              | 91                      | 90                      | 92                      | 94                      |

\* Numbers for goat habitat reflect indirect loss as a result of road disturbance, i.e. not a direct loss of habitat.

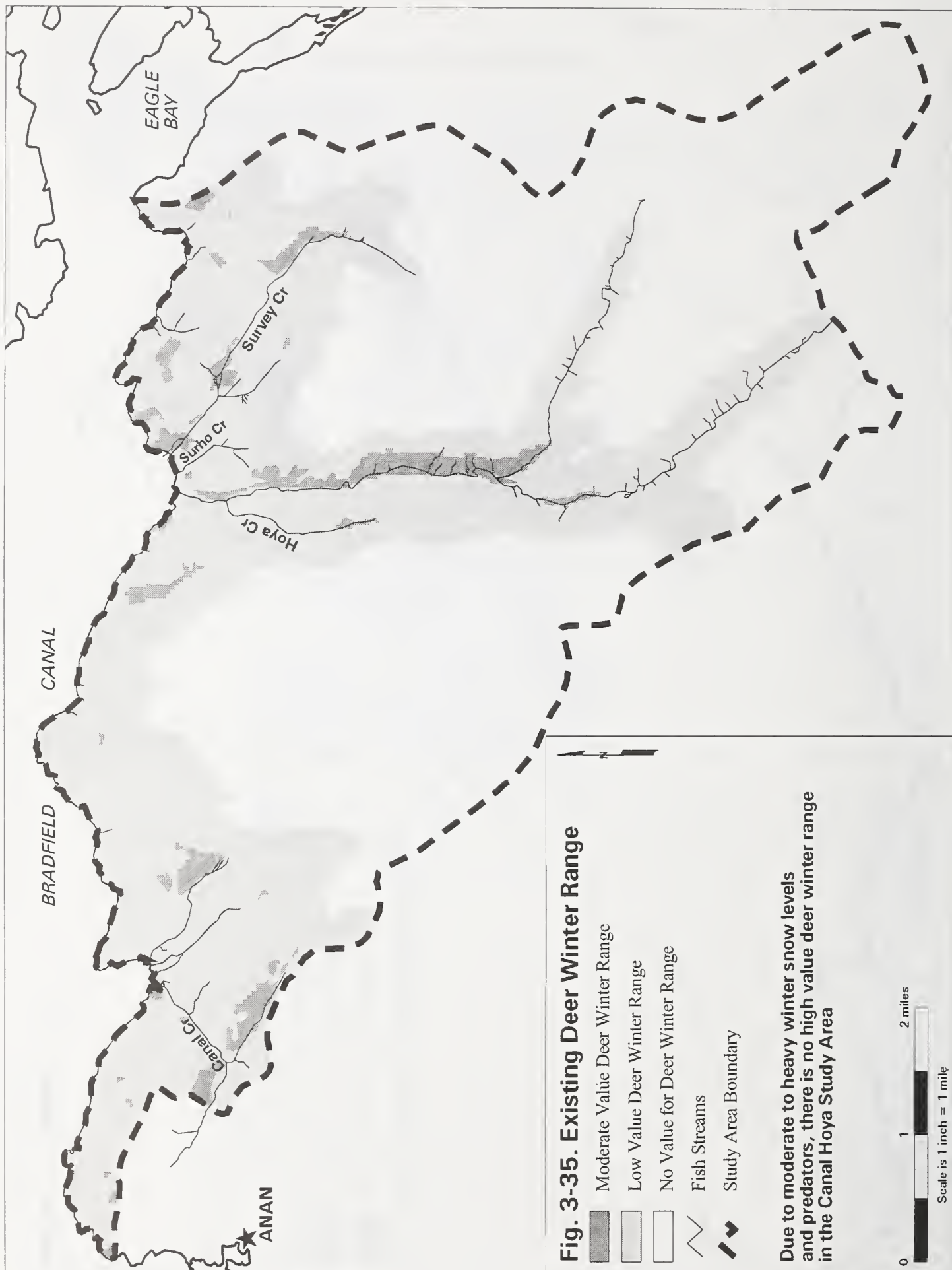
\*\* Numbers reflect acres of moderately suitable habitat. No high value habitat (hsi score > .67) exists for deer in the project area .

Table 3-20  
**Percent of Existing Overall Habitat Capability  
Remaining by Alternative**

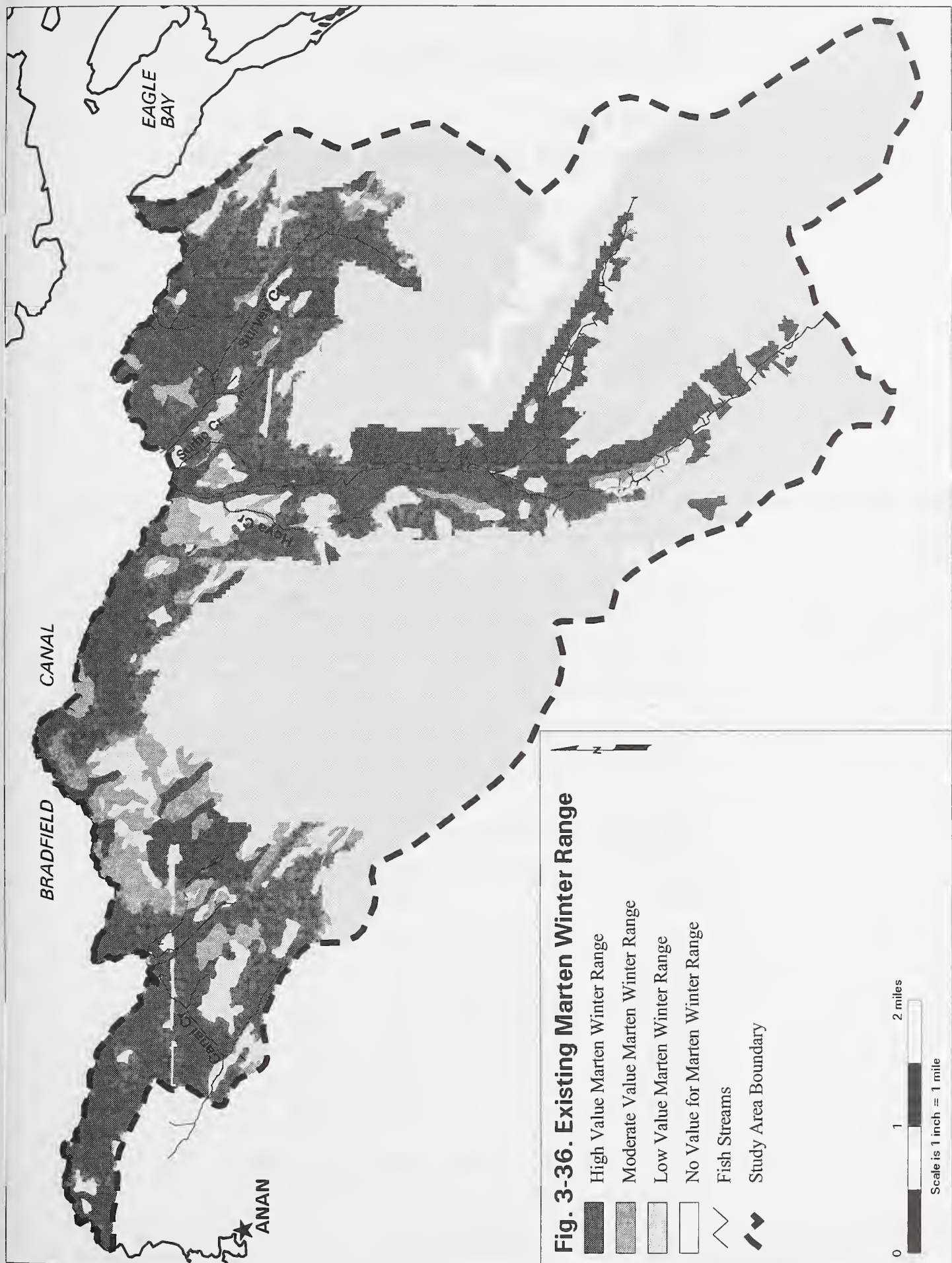
| Species | Alt 1 | Alt 2 | Alt 3 | Alt 4 |
|---------|-------|-------|-------|-------|
| Goat    | 91    | 87    | 89    | 95    |
| Deer    | 92    | 92    | 94    | 95    |
| Marten  | 95    | 95    | 95    | 96    |

\* Percent is ratio of overall area hsi index values









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### Issue Five: Freshwater and Marine Resources

This issue reflects concern for the effects of timber harvest, road construction and road management on freshwater and marine fish habitats in and adjacent to the project area. There is also concern about the effects of LTFs and marine water-based log processing activities on charter and commercial fishing operations in the Bradfield Canal. The State of Alaska has designated the beneficial use of fresh and marine waters in the project area for the growth and propagation of fish, shellfish, other aquatic life, and wildlife (18 AAC 70). By law, we must maintain these uses, protect riparian habitat, and prevent detrimental changes in water temperature, water chemistry, stream channel stability, and sediment loads that adversely affect these uses.

#### Freshwater Resources

##### Fish Habitat

##### Affected Environment

Fisheries crews surveyed much of the project area by electroshocker in 1994. Follow up electroshocking in 1996 and 1997 focused on determining upstream limits of fish populations, particularly in the vicinity of proposed roads and units.

The project area contains approximately thirty miles of fish-bearing streams. Cutthroat trout and Dolly Varden char are widely distributed throughout both VCUs. Salmon and steelhead access is limited to the lowest stream reaches by impassable bedrock falls or steep gradients. Anadromous species commonly observed in the project area include coho salmon, pink salmon, and chum salmon. A few juvenile steelhead and one Chinook salmon smolt were also reported, but the presence of these species is considered incidental in the project area. No fish habitat enhancement opportunities appear feasible.

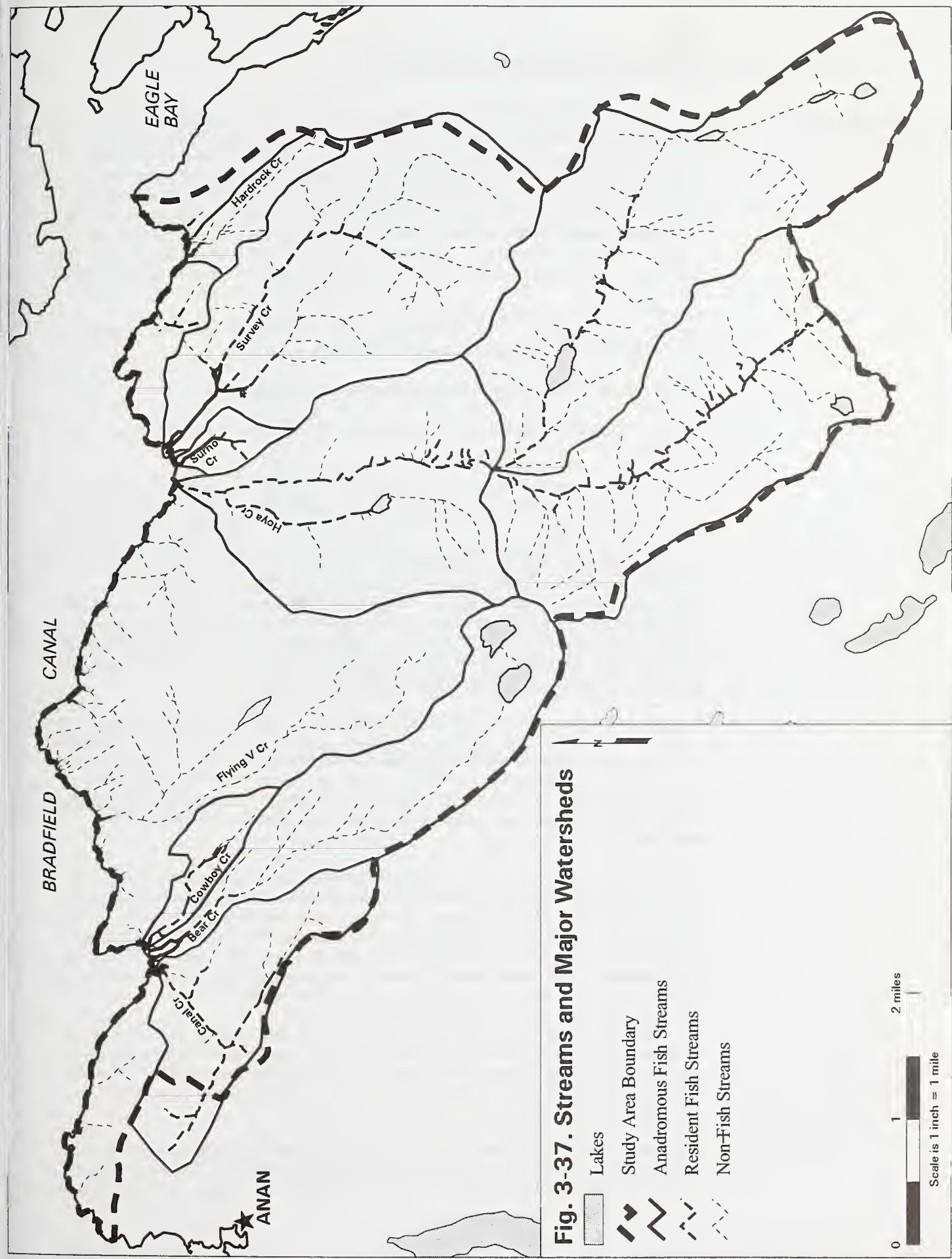
Table 3-21 displays fish stream lengths in each major project area watershed. All watershed or stream names in this project area are local unofficial names except for Hoya Creek. Class I streams contain anadromous fish species. Class II streams contain only resident fish species

Table 3-21  
Distribution of Fish Streams

| Watershed Name | ADFG Number  | Class I (miles) | Class II (miles) | Total Fish Stream (miles) |
|----------------|--------------|-----------------|------------------|---------------------------|
| Canal          | 107-40-10650 | 0.2             | 3.9              | 4.1                       |
| Bear           | 107-40-10640 | 0.8             | 0.6              | 1.4                       |
| Cowboy         | none         | 0.1             | 1.6              | 1.7                       |
| Flying V       | 107-40-10630 | 0.1             | 0.1              | 0.2                       |
| Hoya           | 107-40-10590 | 0.1             | 18.8             | 18.9                      |
| Surho          | none         | 0.5             | 0.6              | 1.1                       |
| Survey         | 107-40-10570 | 1.8             | 4.0              | 5.8                       |
| All Others     | n/a          | 0.1             | 1.3              | 1.4                       |
| <b>TOTAL</b>   |              | <b>3.6</b>      | <b>28.9</b>      | <b>32.5</b>               |

Figure 3-37 displays these watersheds and their stream networks.







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## Distribution of Fish Streams

The extent of anadromous fish habitat in the project area is quite low when compared to nearby watersheds such as Eagle River or Anan Creek. Survey Creek (Hoya VCU) contains the most anadromous fish habitat. The fisheries crew conducted a detailed habitat survey of lower Survey Creek in 1996. The highest quality habitat is found in low gradient stream reaches below the road crossings of Survey Creek, and at the mouth of Bear Creek (Canal VCU). These large alluvial streams, along with their sidechannels, provide good spawning and rearing habitat for salmon. Both Canal and Hoya Creeks have barrier falls near salt water. There is a large quantity of low gradient stream in Canal Creek and Hoya Creek; it is inaccessible to anadromous fish, but provides high quality resident fish spawning and rearing habitat.

Fish (cutthroat) have been observed in only one project area lake located in the upper east fork of Hoya Creek within the Hoya old growth reserve.

## Environmental Consequences and Alternative Comparisons

Direct impacts on fish habitat may result from streamside (riparian) harvest and road construction.

Each alternative provides a high level of fish habitat protection through both mandatory mitigation measures and project-specific design considerations. Estuary and riparian no-harvest buffers provide direct protection to the highest quality fish habitat in the project area. No alternative proposes harvest adjacent to fish streams. The Tongass Timber Reform Act (TTRA) prohibits harvest within 100 feet horizontal distance of all Class I streams and Class II streams that flow into Class I streams. All alternatives incorporate the riparian management areas described in the Forest Plan; providing additional protection beyond the mandatory TTRA buffers. Furthermore, a 500-foot no harvest buffer has been delineated below road crossings on both sides of Survey Creek and Surho Creek (the Class I stream west of Survey Creek) to protect brown bears foraging on fish in these streams. Both Canal and Hoya old growth reserves protect high quality resident fish habitat.

A review of the alternative maps provides a comparison of the alternatives with respect to the amount of harvest in close proximity to fish streams throughout the project area. Alternative 1 harvests the most acres in close proximity to fish streams in both VCUs. Alternatives 2 and 3 treat the Hoya VCU similarly, but harvest slightly less Canal VCU acres close to fish streams than Alternative 1. Alternative 4 harvests the least acres in close proximity to fish streams across the project area, although it harvests the most acres in Survey Creek's watershed.

The rugged terrain in the project area presented a challenge to road locators. However, the road system proposed in all alternatives incorporates location and design considerations to reduce direct impacts on fish habitat by minimizing fish stream crossings and road alignments in close proximity to fish streams. For example, the Canal VCU road system considered early in this project would have crossed lower Canal, Bear, and Cowboy Creeks. It was dropped in favor of the currently proposed road, thereby eliminating the need for Class I and some high maintenance Class II stream crossings in this VCU.

Alternative 4 proposes up to 15 fish stream crossings. Table 3-22 shows these crossings by watershed. The fisheries crew electroshocked all streams crossed by the proposed road system and the project hydrologist reviewed fish stream crossing sites in the field to ensure that crossing locations are compatible with fish habitat and water quality protection objectives.

The crossing on the east fork of Survey Creek is the only site where anadromous fish have been verified at or upstream of a proposed road. This is the only Class I stream crossing proposed in any alternative; a bridge is proposed at this site. Both Surho Creek crossings and

most of the Survey Creek crossings are at the upper limit of resident fish habitat in very small streams. Drainage structures designed for these crossings would consider the need for resident fish passage. All other structures in Table 3-22 would be designed and installed to maintain fish passage. The largest stream crossings are at Bear Creek, Hoya Creek, and the two forks of Survey Creek. The west fork of Survey Creek is an unstable site with overflow channels and has a high risk of failure. The design of this structure will incorporate features to minimize the risk of failure and minimize potential resource damage resulting from failure. Appendix D provides additional detail about each crossing.

**Table 3-22**  
**Comparison of Alternatives - Fish Stream Crossings**

| <b>Watershed Name</b> | <b>Alt 1</b> | <b>Alt 2</b> | <b>Alt 3</b> | <b>Alt 4</b> |
|-----------------------|--------------|--------------|--------------|--------------|
| Bear                  | 0            | 1            | 0            | 0            |
| Cowboy                | 2            | 2            | 0            | 0            |
| Hoya                  | 3            | 3            | 3            | 0            |
| Surho                 | 2            | 2            | 2            | 0            |
| Survey                | 7            | 7            | 7            | 2            |
| <b>TOTAL</b>          | <b>14</b>    | <b>15</b>    | <b>12</b>    | <b>2</b>     |

In summary, direct impacts associated with harvest adjacent to fish streams have been avoided. Indirect impacts associated with watershed harvest are addressed below. Road construction (especially drainage structure installation), road use, and road maintenance would inevitably introduce sediment to fish streams in any alternative. Alternatives constructing the most road would have the most direct impacts. The use of standard and site-specific Best Management Practices (BMPs) would ensure that this impact is short term and minimized to the extent feasible. BMPs are described on road cards, included in design drawings, and enforced through road construction specifications. BMP implementation monitoring is described in Appendix C.

## Floodplains and Riparian Areas

### Affected Environment

Floodplains moderate floodflow, recharge stream low flow, and provide deposition areas for sediment. The decay of salmon carcasses deposited on floodplains during fall peak flows is an important part of the nutrient cycling process. Riparian areas, including floodplains, contain vegetation that provides shade, large wood for fish habitat and channel stability, and litter fall as a nutrient and food source for fish. Intact riparian areas also intercept sediment and provide critical habitat for wildlife species feeding on fish and other aquatic organisms.

Table 3-23 shows the distribution of stream process groups in each major watershed. The values shown are Class I, II, and III stream miles. Tongass National Forest streams have been classified and mapped according to these process groups, which serve as the basis for delineating riparian management areas or no-harvest buffers (USDA 1997a). The process groups reflect physical differences in stream channels and stream processes (USDA, 1992). Floodplain (FP), estuarine (ES) and palustrine (PA) streams represent the most important and sensitive riparian areas in the project area. These low gradient streams contain the highest quality fish habitat and are the most sensitive to sediment deposition. Alluvial fan (AF), moderate gradient mixed control (MM), and moderate gradient contained (MC) streams are slightly steeper and alternately receive and transport sediment. They usually contain fish habitat. High gradient contained (HC) streams are headwater streams, have limited fish habitat (usually Class II, if any) and function as conduits of sediment and debris to downstream reaches. Class IV streams are not shown in Table 3-23.

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Table 3-23  
Distribution of Stream Process Groups  
(Stream Miles by Watershed)

| Process Group | Canal      | Bear       | Cowboy     | Flying V   | Hoya        | Surho      | Survey      |
|---------------|------------|------------|------------|------------|-------------|------------|-------------|
| ES            | 0.1        | 0          | 0.1        | 0          | 0           | 0.2        | 0           |
| FP            | 0          | 0          | 0.3        | 0          | 3.4         | 0          | 1.3         |
| PA            | 1.3        | 0          | 0          | 0          | 0.8         | 0.3        | 0           |
| AF            | 0          | 0.8        | 0.3        | 0          | 1.7         | 0          | 0.3         |
| MM            | 1.7        | 0          | 0.9        | 0.5        | 2.4         | 0.1        | 0.7         |
| MC            | 0          | 1.3        | 0          | 0.9        | 4.4         | 0          | 2.0         |
| HC            | 3.0        | 5.9        | 0.7        | 7.2        | 20.1        | 0.7        | 13.4        |
| <b>TOTAL</b>  | <b>6.1</b> | <b>8.0</b> | <b>2.3</b> | <b>8.6</b> | <b>32.8</b> | <b>1.3</b> | <b>17.7</b> |

The most important riparian habitats in the project area are associated with the high quality fish habitat described above.

#### Environmental Consequences and Alternative Comparisons

Direct impacts to floodplains and riparian areas may result from vegetation and ground disturbance in these areas. Each alternative provides a high level of riparian and floodplain protection through both mandatory mitigation measures and project-specific design considerations. Most of these are described in the fish habitat discussion above. Riparian management areas associated with Class I, II, and III streams in the vicinity of proposed roads and units were verified by field crews and in many cases, unit boundaries and road locations were changed to protect riparian resources. For example, a road system accessing upper Hoya Creek was considered early in the project but dropped because the only feasible approach to this area was through a canyon pinch-point in the vicinity of Unit 21. This road would have encroached on Hoya Creek and its floodplain. Even as a temporary road with all drainage structures removed, we were concerned that mitigation measures to maintain floodplain function, channel stability, and fish habitat would have a high risk of failure, resulting in chronic long-term impacts to these resources. Therefore, the upper Hoya road system was dropped.

None of the alternatives propose modifications to the riparian standards and guides described in the Forest Plan. The widths of the riparian management areas (no-harvest buffers) vary by process group. Units proposed in Hoya and Survey Creek floodplains were entirely dropped to provide complete floodplain (FP stream) protection. Some buffers are 120 (MM streams) or 140 (AF streams) feet wide. Large V-notches (Class III HC streams) have complete sideslope protection: unit boundaries were flagged at the edge of the notch or beyond. Buffers on small Class III streams within units are generally individual leave trees or narrow buffers that completely protect the stream sideslope. The unit cards and maps display these details.

Windthrow is not of great concern in the project area due to the north-south orientation of most drainages, topographical protection of high ridges. Field crews did not observe much windthrow in the project area.



## Watersheds

### Affected Environment

The watersheds of the project area are dominated by steep mountain slopes and narrow valleys. Snow and debris avalanches appear to be relatively frequent and important disturbance processes in the upper watersheds. Much of the mainstem of Hoya Creek, for example, appears to be heavily influenced by recent deposits of sediment and debris from mass failures.

A simple watershed sensitivity analysis based on GIS soils, streams, and slope data shows that Hoya Creek is the most geomorphically sensitive watershed in the project area. Table 3-24 displays a summary of the sensitivity analysis. The analysis did not consider watersheds less than 500 acres in size. (Small watersheds tend to appear more sensitive than large watersheds in this type of analysis). A digital elevation model was used to calculate slope classes. Steep slopes represent sediment sources: they may not accurately portray landslide hazard, but steep slopes rapidly transport sediment should mass wasting occur. Stream density, as miles of stream per square mile of watershed, reflects a watershed's ability to transport sediment through the stream network: high stream densities provide efficient transport. Only Class I, II, and III streams are included in this value. Depositional stream length is an index of the risk of sediment deposition. Floodplain, palustrine, and estuarine process groups are considered depositional streams.

Table 3-24  
Watershed Sensitivity

| Watershed | Area (acres) | Percent Acres > 55% Slope | Percent Acres > 75% Slope | Stream Density (mi/sq mi) | High Transport Stream Length (miles) | Depositional Stream (miles) |
|-----------|--------------|---------------------------|---------------------------|---------------------------|--------------------------------------|-----------------------------|
| Canal     | 1550         | 0                         | 0                         | 2.5                       | 2.9                                  | 1.4                         |
| Bear      | 2120         | 12                        | 1                         | 2.4                       | 4.6                                  | 0                           |
| Flying V  | 2570         | 10                        | 1                         | 2.1                       | 5.8                                  | 0                           |
| Hoya      | 11230        | 41                        | 13                        | 1.9                       | 4.9                                  | 4.2                         |
| Survey    | 3920         | 29                        | 6                         | 2.9                       | 3.8                                  | 1.3                         |

Hoya Creek's watershed has a relatively high proportion of steep slopes. Although its stream network is not the most dense, it has a high proportion of HC3 and HC6 streams which reflect high sediment transport rates. This watershed has significant natural sediment source areas in combination with a relatively high proportion of low gradient streams that are sensitive to sediment deposition. Survey Creek's watershed is also considered sensitive and contains the most anadromous fish habitat in the project area.

Class III and IV streams were mapped by field crews in 1996 and 1997. Many previously unmapped streams were discovered in the vicinity of proposed units and roads.

### Environmental Consequences and Alternative Comparisons

The sensitivity of Hoya and Survey Creek watersheds became an important consideration in designing a timber sale in the Hoya VCU. The Hoya old growth reserve provides a long term benefit by protecting some of the most sensitive watershed acres in the project area. Providing complete protection to large portions of both watersheds was not compatible with the objectives of the Management Prescription for the Hoya VCU, and would not have met the purpose and need for this project. The higher overall quality of both fish and wildlife habitat in Hoya Creek's watershed, as well as the difficulties in accessing timber in upper Hoya Creek, led to the conclusion that Hoya Creek was more suited to old growth reserve designation. All alternatives provide a high level of fish habitat and riparian protection to Survey Creek's watershed as described previously. Table 3-25 shows the acres and proportion harvested by major project area watersheds.

### 3 Environment and Effects

Table 3-25  
Alternative Comparison  
Watershed Acres and Percent Harvested

|                    | Alt 1      | Alt 2      | Alt 3      | Alt 4      |
|--------------------|------------|------------|------------|------------|
| Canal Acres        | 60         | 65         | 0          | 0          |
| Canal Percent      | 4          | 4          | 0          | 0          |
| Bear Acres         | 25         | 95         | 0          | 0          |
| Bear Percent       | 1          | 4          | 0          | 0          |
| Cowboy Acres       | 70         | 50         | 10         | 0          |
| Cowboy Percent     | 18         | 13         | 3          | 0          |
| Flying V Acres     | 15         | 20         | 30         | 55         |
| Flying V Percent   | 1          | 1          | 1          | 2          |
| Hoya Acres         | 140        | 135        | 135        | 5          |
| Hoya Percent       | 1          | 1          | 1          | 0          |
| Survey Acres       | 275        | 305        | 325        | 385        |
| Survey Percent     | 7          | 8          | 8          | 10         |
| All Other Acres    | 197        | 130        | 205        | 170        |
| <b>TOTAL Acres</b> | <b>782</b> | <b>800</b> | <b>705</b> | <b>615</b> |

Alternative 4 proposes the most harvest in a sensitive watershed (Survey Creek). However, the proportion harvested is not considered excessive for a first entry, particularly since this alternative proposes less disturbance overall in the watershed by constructing less road and by not constructing a crossing on the west fork of Survey Creek, which has a high risk of failure.

Table 3-26 displays amount of total road (temporary and specified ) proposed by watershed in each alternative.

Table 3-26  
**Alternative Comparison**  
**Watershed Road Miles Constructed**

| <b>Watershed</b>   | <b>Alt 1</b> | <b>Alt 2</b> | <b>Alt 3</b> | <b>Alt 4</b> |
|--------------------|--------------|--------------|--------------|--------------|
| Canal              | 0            | 1.0          | 0            | 0            |
| Bear               | 0            | 1.6          | 0            | 0            |
| Cowboy             | 0.9          | 1.5          | 0            | 0            |
| Flying V           | 0            | 0            | 0            | 0            |
| Hoya               | 2.2          | 2.0          | 2.0          | 0            |
| Surho              | 1.1          | 0.8          | 0.9          | 0            |
| Survey             | 4.3          | 5.2          | 5.2          | 2.1          |
| All Other Miles    | 2.0          | 2.5          | 1.2          | 1.0          |
| <b>TOTAL Miles</b> | <b>10.6</b>  | <b>14.6</b>  | <b>9.3</b>   | <b>3.1</b>   |

Class III and IV stream mapping focused on determining the effects of these headwater streams on unit boundaries and logging systems. All Class III streams are buffered according to riparian standards and guides in the Forest Plan. Class IV streams are protected through specific BMPs controlling logging operations. Unit cards describe both kinds of protection.



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## Marine Resources

### Affected Environment

#### *A sampling of public comments:*

*"We believe that the recommendations presented in the Anadromous Fish Habitat Assessment report, including the use of watershed analysis, should be used to develop appropriate protections for all streams within the Project Area (including those not presently afforded protection under the Tongass Timber Reform Act)."*

*"...the EIS should include an evaluation of impacts to resident fish and reflect project-design elements that ensure beneficial uses related to the growth and propagation of resident species would be maintained."*

*"How will water quality, turbidity, sediment-loading, macroinvertebrate populations, and flow be affected in Canal, Hoya, and other fish-bearing creeks in the Project Area?"*

*"Bridges rather than culverts should be used on larger fish streams, and the number of stream crossings should be minimized."*

*"The EIS should clearly identify road closure and maintenance practices to be employed..."*

*"I strongly encourage you to look somewhere else for the volume and give the 12 or so fishermen who fish [the Bradfield Canal] at least 5 years between sales in the immediate area. The increase in boat and log traffic in the area...results not only in lost gear but in substantial areas that we cannot*

The project area drains into the Bradfield Canal, an important commercial crab and shrimp fishery for Wrangell and a fairly popular (though somewhat remote) sport fishing destination for guides and charter boats from Wrangell and other communities. The Bradfield Canal is a fjord, extending about sixteen miles inland (east) from the northern end of Ernest Sound to the Bradfield River mouth. The canal ranges from one to two miles wide and is charted to about 150 fathoms deep. The convoluted project area shoreline is approximately fourteen miles long and is characterized by estuarine, intertidal, and deepwater marine (permanently flooded) habitats.

Estuaries are areas where fresh water mixes with salt water; unique brackish environments supporting complex and productive ecosystems. The confluence of several large streams into relatively sheltered bays produces high quality estuaries at the mouths of both Canal and Hoya Creeks. Both of these estuaries are smaller and less sheltered than the Anan Creek and Eagle River estuaries located on either side of the project area. Canal and Hoya estuaries, which together represent about two miles of shoreline, are considered sensitive habitats, supporting shellfish and intertidal salmon spawning and nursery habitat. A SCUBA survey of Canal Bay (an LTF site dropped from further consideration) near the east edge of the Canal estuary noted many Dungeness crab. The intertidal flats associated with these estuaries store fine sediment supporting sedges and grasses which bears and ungulates feed on in the spring. Adult fish use estuaries as staging areas for migrating up streams. Shorebirds, waterfowl, eagles, ospreys, bears, wolves, mink, land otters and other wildlife are drawn to these attractions.

Apart from the estuaries, most of the project area shoreline is composed of steeply plunging bedrock walls and shelves. SCUBA surveys of the three proposed LTF sites noted a rapid transition from intertidal to deepwater habitat. Barnacles and mussels are abundant here and attract birds and mink. Herring spawn has been observed along much of the rocky shoreline.

The deepwater habitat comprising most of the Bradfield Canal provides habitat for a wide array of marine species. Target species for commercial and marine sport fishing include Dungeness and tanner crab; pink, spot, sidestripe and coonstripe shrimp; halibut; and Chinook, coho, and sockeye salmon. Red king crab are not known to be present in the Bradfield Canal. The current commercial fisheries within the canal include pot and beam trawl shrimping, pot and ring crabbing, long-line halibut, and winter salmon trolling. There is a eulachon seine fishery in the Bradfield River. Seals, orcas, humpback whales and Pacific white-sided dolphins have also been observed in the canal. Commercial fishing, charter, and recreational boats are known to use the sheltered estuaries and coves adjacent to the project area for anchorages and staging areas for land-based activities such as hunting.

### Environmental Consequences and Alternative Comparisons

The potential effects on marine resources, as well as fishing and boating activities in the Bradfield Canal were important considerations in selecting and designing LTF sites and planning water-based activities associated with proposed timber harvest. Marine resources are potentially affected in the following ways: 1) ground disturbance in the immediate vicinity of estuaries and intertidal areas could result in sediment increases; 2) vegetation changes in and around estuaries may reduce habitat quality for marine species as well as terrestrial species dependent on marine species; 3) LTF construction may temporarily or permanently displace marine species; 4) log processing activities in and adjacent to marine areas could introduce pollutants and debris to marine waters; 5) helicopter log drops, barges, and log rafts could displace or interfere with commercial fishing operations and charter or recreational boating (see Figure D-1, Appendix D).

*"No LTF in bay where Canal Creek enters....Capsize Cove is the only anchorage between Anan and the Eagle and is the best anchorage for N and SE winds in the Bradfield. Provision must be made to assure that the fishing fleet has continued and uninterrupted use of this area."*

*"The Campbell logging operation dumped a lot of limbs onto the crab and shrimp grounds and tops and limbs drifted down to Blake Island where several boats were charter fishing."*

*"I am concerned about the very real negative impacts on the fishery--commercial and sport--as the streams in this area would be affected by logging."*

The first two potential impacts are minimized through avoiding ground disturbance and harvest within 1000 feet of estuaries and beaches (intertidal areas). The only disturbance proposed within this zone is LTF and access road development. Two early LTF sites (Canal Bay and Hoya Bay) were dropped from further consideration due to their proximity to estuaries. Roads connecting LTFs to harvest units head abruptly away from the shoreline. Sort yards are located in uplands 1000 feet or more from salt water and well away from estuaries. Harvest units are located 1000 feet or more from estuaries.

Other potential marine impacts are minimized through the location and design of the LTF, and by establishing operating guidelines to control pollution and debris and avoiding the likelihood of conflicts with other Bradfield Canal users. Appendix D contains a summary of the LTF siting guidelines for the proposed LTF sites and a summary of mitigation measures incorporated into the LTF designs and operating guidelines.

The alternative with the highest volume is likely to have the highest potential for conflicts with other Bradfield users. Table 3-27 displays volumes produced by each alternative. Alternative 2 (the highest volume) would involve the most log rafting and have the most potential for operations and debris interfering with other marine users.

Alternatives 3 and 4 are likely to have the least impacts, since only one LTF is proposed.

Table 3-27  
**Comparison of Alternatives  
Marine Impacts**

|                      | Alt 1 | Alt 2 | Alt 3 | Alt 4 |
|----------------------|-------|-------|-------|-------|
| Volume MMBF thru LTF | 14.9  | 17.1  | 11.8  | 8.2   |
| Volume MMBF to Barge | 1.1   | 0     | 3.1   | 4.1   |
| Number of LTFs       | 2     | 2     | 1     | 1     |

## **3 Environment and Effects**

### **Other Environmental Considerations**

#### **Irreversible and Irretrievable Commitments of Resources**

Irreversible and irretrievable commitments of resources concerns resources that we would affect that would not be returned or could return, but only over long periods of time. For this analysis, the irreversible disturbance of some types of cultural resources could occur on unknown sites, subsurface sites, or even known sites when unplanned events occur.

Use of petroleum fuels and rock sources for road and sort yard construction commits non-renewable resources. Alternative 5, the no action alternative, has no effect on mineral resource use at this time.

Constructing roads in the project area would irreversibly reduce the potential amount of area that could be designated as part of the Wilderness Preservation System or managed for other purposes that require natural characteristics. Roads would also commit a certain amount of acres of forest and muskeg and would eventually be converted over time to seed beds for grasses and alder. Alternative 5 would not have these consequences.

Under all action alternatives, there would be an irretrievable loss of old growth forest unless rehabilitation occurs over a period of 250-300 years. Due to increased fragmentation, other old growth areas adjacent to units would have their habitat values reduced.

#### **Unavoidable Environmental Effects**

Although we designed mitigation measures, units and roads to avoid adverse consequences, some environmental impacts cannot be completely mitigated and would be expected to occur:

Air quality would diminish on a recurring, temporary basis due to the construction of roads, timber harvest, and hauling. Limbs and logging slash would be burned at sort yards intermittently throughout the logging periods which, would deposit minor amounts of particulate matter and smoke into the air.

Although Best Management Practices are designed to protect soil and water, some potential for surface erosion, sediment production, channel erosion, and mass movement does exist. Road development poses a risk of sediment production, while helicopter yarding reduces this risk considerably. Sediment production could displace fish or result in a loss of habitat near stream crossings and temporarily affect the function of the freshwater system.

Increased human activity both during and after logging, and loss of habitat, would result in impacts to fish and wildlife species, particularly those populations that have low numbers or are more sensitive to the presence of people. The habitat for old growth associated species would be reduced. Travel corridors between old growth blocks in adjacent watersheds would also be reduced in size and fragmented, which may affect the ability for individuals to disperse and genetic material to exchange among local populations of species.

Although the degree of impact varies with the alternative selected, logging operations would temporarily affect the use of the area by guides, commercial fishermen, tourists, and local recreationists. There would also be some loss of primitive and semi-primitive recreation opportunities in the project area. The natural landscape, as viewed from the Bradfield Canal, would appear visually altered and may be noticeable to viewers.



**We have determined the alternatives are consistent with the Alaska Coastal Management Plan and request that the State review our findings.**

## **Alaska Coastal Management Program**

We have determined that the proposed alternatives, including the preferred alternative, are consistent with the Alaska Coastal Management Program to the maximum extent practicable. We have based this determination on the analysis and mitigation measures outlined in this document. In particular, we direct your attention to our methods of addressing Issue 5 (Freshwater and Marine Resources), and the specific measures outlined and summarized in the Unit, Road and Log Transfer Facility cards (Appendix A, B, and D). We are requesting that the Division of Governmental Coordination review our finding of consistency on the preferred alternative during the comment period.

## **ANILCA Section 810 Subsistence Evaluation Process**

Section 810 of the Alaska Native Interest Lands Conservation Act (ANILCA) requires a Federal agency, having jurisdiction over public lands in Alaska, to analyze the potential effects of proposed land-use activities on subsistence uses and needs. An ANILCA 810 analysis should include:

- An evaluation of the possibility of affects on subsistence uses;
- A distinct finding on whether the proposed action may significantly restrict subsistence uses;
- Notices and hearings if the evaluation results in a finding that the proposed action may significantly restrict subsistence uses; and
- Determinations if, following a public hearing a finding of a significant restriction remains, the responsible official decides to proceed with the proposed project.

Evaluation criteria used to assess the effects of the proposed alternatives are: (1) changes in abundance or distribution of subsistence resources, (2) supply and demand, (3) changes in access to subsistence resources, and (4) changes in competition from non-subsistence users for those resources. The evaluation determines whether subsistence uses within the project area or portions of the area may be significantly restricted by any of the proposed action alternatives. Wrangell is the only community that meets the criteria in this area for inclusion in the subsistence 810 analysis (Kruse 1993). Wildlife, fish, shellfish, marine mammals, other foods, and timber are the resources used for subsistence that are evaluated in this document. The evaluation relies heavily upon wildlife habitat capability models developed in support of the Forest Plan Revision and displayed in Appendices K and L of the 1991 Supplement to the Draft EIS for the Tongass Land Management Plan Revision. A complete Subsistence Report is in the planning file.

## **Canal Hoya Subsistence/ANILCA 810 Findings**

The Findings are based on the evaluations in the Subsistence Report on abundance, distribution, supply and demand, access and competition for harvested resources in the project area, WAA 1814 and the Bradfield Canal. There would be some decreases in habitat capability for wildlife under the action alternatives.

Habitat capability can support populations greater than projected harvest demand for deer, black bear, mountain goat and furbearers under all alternatives through the rotation (USDA 1991). The area is not extensively used for subsistence harvesting. The 1987-1993 harvest rate for deer was 0 which also equals the estimated future hunter demand (ADFG 1991, USDA 1997a). Harvest of marten has been highly variable, ranging from zero to 50 in any given year. The effects on finfish and shellfish populations are expected to be minimal and should not affect the supply available for subsistence harvest.

### 3 Environment and Effects

Although brown bear numbers remain relatively stable (according to our models), demand will surpass what the population can support (USDA 1991). Table 3-28 shows the past harvest levels, predicted brown bear populations needed to meet future demand and estimated habitat capability (supply). Roads developed in conjunction with this sale would increase hunter access to brown bear populations which is being mitigated by closing roads to motorized use. Monitoring brown bear mortality after the sale would assist in detecting downward population trends. From a subsistence standpoint, brown bear are generally not considered a food source but rather a very limited use is made of parts of the bear for cultural purposes. Harvest by nonresidents is high (73%) and nonresident harvest increases yearly within this Game Management Unit. Demand (hunter harvest) is currently regulated by the Alaska Department of Fish and Game. If the brown bear population in this area declines, a subsistence priority would go into effect and hunting may be limited to rural residents. Projected demand surpasses the carrying capacity of the habitat even under existing conditions.

Although there may be some long term changes in access, we do not expect that the increased access would reduce subsistence harvests below historic levels. Alternative 2 would result in construction of the most roads, followed by alternatives 1, 3 and 4. Closure of roads to motorized access would further mitigate these effects. A substantial increase in competition for subsistence wildlife resources from non-rural community residents is not projected to result from the alternatives proposed.

*There will not be a significant restriction on subsistence uses as a result of this sale*

*A finding that there will not be a significant restriction on subsistence uses as a result of this sale is in order for wildlife, fish, and shellfish, marine mammals, other foods, and timber resources.*

Table 3-28  
Harvest demand and estimated habitat capability  
for WAA 1901 (SDEIS 1991, USDA 1997a)

| Species     | Annual Harvest<br>(from TLMP SDEIS) | Population Needed* |      |      |      | Estimated Habitat Capability<br>(from TLMP SDEIS preferred alt) |      |      |      |
|-------------|-------------------------------------|--------------------|------|------|------|---|------|------|------|
|             |                                     | 1990               | 2000 | 2010 | 2040 | 1990  | 2000 | 2010 | 2040 |
| Deer        | 0                                   | 0                  | 0    | 0    | 0    | 687   | 687  | 687  | 641  |
| Black Bear  | 0.3                                 | 4                  | 4    | 5    | 8    | 97  | 97   | 95   | 93   |
| Brown Bear  | 0.9                                 | 23                 | 27   | 31   | 48   | 24  | 24   | 24   | 23   |
| Goat        | 0.9                                 | 13                 | 15   | 18   | 27   | 28  | 28   | 28   | 28   |
| Marten      | 7.6                                 | 19                 | 22   | 26   | 30   | 62  | 59   | 59   | 56   |
| River Otter | 1.3                                 | 3                  | 4    | 5    | 7    | 25  | 25   | 25   | 25   |

\* Assume harvest rate of 7% for black bear, 4% for brown bear, 7% for goats, 10% for deer, 40% for marten and 40% for river otter. Demand for all species increases by 18% per decade through 2010 and 15% per decade through 2040.

## Other Issues

### Cultural Resources

Heritage resources represent past human activities that span the last several thousand years. While present, heritage resources in the project area are limited in size, complexity and age. This suggests the project area has not witnessed concentrated human activity such as that represented by ancient village sites, camps and other settlements. Stikine Area archaeologists have recorded six heritage resource sites in the project area, including one historic cabin (Site XBC-028), an intertidal rock alignment (Site XBC-039), one historic mine adit (Site XBC-040), an ancient fish trap (Site XBC-041), one historic log crib structure (Site XBC-042), and an alpine rock cairn site (Site XBC-043). After applying the eligibility criteria for the National Register of Historic Places we have determined that the two sites, XBC-041 and XBC-043, are eligible. Site XBC-041, and intertidal fish trap, would not be affected by any of the proposed alternatives. Site XBC-043 is located in the Alpine zone, outside the area of potential effect. We have determined that no sites eligible to the National Register of Historic Places would be affected under any the alternatives.

We conducted an extensive archival and literature search to references to heritage resources in the project area. We also consulted the Alaska Heritage Resource Survey, a statewide listing of heritage resources. The search reveals very little specific information about the project area. The project area is within the former territory of the Stikine Tlingit and various documents attribute ownership of Bradfield Canal to the Nanyaayih, Kiks'adi and Katch'adi clans. Ethnographic records suggest the Stikine Tlingit preferred other area of the Bradfield Canal compared to the project area. Historic records document limited logging, mining and trapping activities in the project area.

Pervious heritage resource investigations in the project area have been limited in scope. In 1980 Elizabeth Andrews (1980) conducted a survey of portions of the Tyee Lake Hydroelectric Project powerline that traverse the project area, but she found no sites. In 1984 Forest Service archaeologist Larry Roberts (1984a) conducted a survey of several log transfer facilities along the southern Bradfield Canal coastline. He only found evidence of modern logging activities. Also in 1984, Roberts (1984b) surveyed about 18 acres for a timber sale proposed in the project area. Roberts recorded one historic cabin (Site XBC-028).

Between May 1993 and September 1994, Stikine Area archaeologists surveyed about 600 acres within the project area. The archaeologist designed a model to predict the probability of heritage resources for any portion of the project area. The model divides the study area into high and low probability zones. We defined the high probability zone as all areas between mean and high tide and 100 feet elevation. We included areas along anadromous fish streams and, because of the potential for culturally modified trees, we included concentrations of cedar. Ethnographic records refer to Tlingit goat hunting in Bradfield Canal so we also targeted some alpine areas for field survey. The low probability zone includes all lands not in the high probability zone. We focused most of our survey in the high probability zone, but we did allocate some survey effort in the low probability zone.

Stikine Area archaeologists recorded five new sites, bringing to six the total number of sites for the project area. Due to lack of integrity and absence of associated artifacts we have determined that four of the sites (Sites XBC-028, XBC-039, XBC-040, XBC-042) are not eligible to the National Register of Historic Places. There are two sites in the project area (Sites XBC-041, XBC-043) that do meet the National Register eligibility criteria. Site XBC-041 is an intertidal fish trap site that is protected by a beach fringe buffer. Site XBC-043 is an alpine site, well away from planned timber harvest or road construction. Therefore we have determined that no sites eligible to the National Register of Historic Places would be affected by any of the considered alternatives.



# 3 Environment and Effects

Federal laws and regulations require processes for considering the impacts of Federal projects on significant heritage resources, i.e. sites eligible to the National Register of Historic Places. Major legislation related to these processes includes the National Historic preservation Act. As amended; the Archaeological Resources Protection Act, as amended; the American Indian Religious Freedom Act and the Native American Graves Protection and Repatriation Act. Section 106 of the National Historic Preservation Act (and the regulations in 36 CFR 800) outlines a process for evaluating the effects Federal projects may have on heritage resources. It involves inventorying heritage resources within a project area, determining which are significant or eligible to the National Register of Historic Places, evaluating project effects and designing and implementing measures to negate any adverse effect that projects may have upon significant heritage resources. This process is undertaken in consultation with the Alaska State Historic Preservation Officer and sometimes with the Advisory Council on Historic Preservation, an independent Federal agency.

We have completed the inventory, made determinations of eligibility and are currently finishing a report outlining our work that will be submitted to the Alaska State Historic Preservation Officer. We will consult with the Alaska State Historic Preservation Officer and complete the Section 106 (National Historic Preservation Act) process prior to issuance of a final EIS. Our intent with this draft EIS is to solicit the views of Alaska Native and other interested persons who may have information about cultural resources in the project area. This draft EIS summarizes existing knowledge of heritage resources within the project area. It is possible that the public is aware of heritage resources the team has not considered in the analysis.

## Soil Resources

Soil development in Southeast Alaska is influenced by high levels of rainfall, cool maritime temperatures, and moderately low yearly soil temperatures. Under these conditions, organic material decomposes slowly, resulting in an accumulation of a organic material. Mineral soils in stable landscapes are typically Spodosol, having a thin albic horizon (leached) with an underlying spodic horizon (Fe & Al accumulation). A thick organic surface horizon composed of forest litter is common on mineral soils.

Deep organic soils develop where the movement of water is impeded by bedrock, or other restrictive soil horizons. All areas with organic soils are considered wetlands (COE, 1987).

## Soil Productivity and Erosion

Ecological functions dictate a relationship between soil forming factors and plant community development. Soils with particular physical chemical and biological characteristics generally support a certain plant community type or association. Deep well drained mineral soils are the most productive sites for tree growth even though tree rooting is generally shallow. Site productivity usually decreases with increasing soil wetness. Timber site productivity on poorly to very poorly drained organic soils, is generally much lower than the productivity of mineral soils. Very little quantitative information on soil nutrient status and timber productivity exists for certain organic wetland soil types (Kaikli, Karheen, Kitkun, and Maybeso soils series). Until further information is available, we will avoid timber harvest on these soils. Because soils are heterogeneous, inclusion of up to 2 acres of organic soils may be included in harvest units (USDA 1997b).

## Erosion

Surface erosion is virtually nonexistent in a natural condition under the forest canopy, except in areas of mass wasting, because the forest floor is protected by living vegetation or by a thick organic surface layer.

## **Mass Wasting**

Mass failures, debris torrents, debris avalanches, etc. are all active, natural erosion processes occurring in the project area. They occur in undisturbed areas and will continue to do so in the future. Many landslides occur during or immediately after a heavy rainfall event, when soils are saturated. The failures usually originate in the mid- to upper-slope positions, at the upper end of small drainages. Failure occurs when the downward force is greater than resisting forces.

Tree roots contribute to the stability of hillslopes in several ways. Roots add strength to the soil by vertically anchoring through the soil mantle into fractured bedrock or other stable substrate. Small roots at the soil surface reinforce the upper soil layer so that it acts as a membrane to provide lateral strength and increased slope stability. After harvesting timber, tree roots deteriorate reducing soil strength and the stability of steep slopes with shallow soils. Large downed wood can also act as a slope buttress. Research in Southeast Alaska (Swanston, 1989) has suggested that although less than 10 percent of all landslides in the past 20 years were related to logging or roads, logging and roads increase the potential for landslides in a given area.

## **Harvest on Oversteepened Slopes**

A high percentage of the forested area in the project area is on very steep slopes (>72%). These lands are not considered suitable for timber management until a site-specific risk assessment has been completed. Cliffs, bedrock exposures, landslides and avalanche tracts are common land type features in these areas. In general, we avoid harvest on oversteepened slopes; however, some short steep pitches do occur in larger areas of lesser slopes. Helicopter yarding and silvicultural prescriptions that leave a substantial amount of trees undisturbed is planned for harvest units with oversteepened slopes. The risk of initiating slope failure and degrading site productivity is a concern when harvesting on oversteepened slopes. Harvest on short pitches of oversteepened slopes poses less risk than harvest on long smooth oversteepened slopes. Slope steepness and soil material were the primary factors used to evaluate slope stability and likelihood of management induced slope failures. Harvest on small inclusions of slopes >72% is proposed in two units, the risk of impacting soil productivity or inducing a mass wasting event as a result of harvest is low.

## **Effects to Soil Resources**

Soil disturbance would result from road building and harvest activities. Road construction takes lands out of productivity, replacing them with a road surface. This is considered a soil/site impact on temporary roads and a permanent change on specified roads. Road and infrastructure construction are expected to cause the most significant impact to soils.

Soil erosion associated with construction of the specified road is primarily along cut slopes. Implementation of BMPs, especially prompt revegetation of cut slopes would reduce the amount of soil erosion.

Miles of temporary road construction is used to compare impacts of the Alternatives. Alternative 2 has the most temporary road construction, 2.8 miles, thus, the greatest impact. Alternative 4 has no temporary road construction, and Alternative 1 and 3 are intermediate with 1.6 miles of temporary road construction. Long term impacts associated with temporary road construction would be mitigated by revegetating roads when they are obliterated.

Harvest units would be designed to minimize impacts to soil. No harvest units are located in areas where harvest might increase the risk of mass failure or cause loss of site productivity due to soil erosion. Some mineral soil material may be exposed by yarding operations. Helicopter yarding is expected to cause much less disturbance than cable yarding. Potential for impacts can be assessed by comparing the acres harvested and harvest method for each Alternative. Alternative 2 is the most likely to cause impacts, Alternative 4 the least and Alternatives 1 and 3 are similar and between 2 and 4.

# 3 Environment and Effects

## Wetlands

Wetlands are defined as : "those areas that are inundated or saturated by surface or groundwater with a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (40CFR 230.41 (a) (1)).

Executive Order 11990, as amended, requires Federal agencies exercising statutory authority and leadership over Federal lands to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands. Federal agencies are required to preserve and enhance the natural and beneficial values of wetlands in carrying out their responsibilities for : 1) acquiring, managing and disposing of lands and facilities; 2) providing federally undertaken, financed, or assisted construction and improvements; and 3) conducting Federal activities and programs affecting land use.

Wetlands were identified using the Corps of Engineers three-parameter system described in U.S. Army Corps Engineers Wetlands Delineation Manual (COE 1987). Wetlands are areas with hydric soils, hydrophytic vegetation, and wetland hydrology. Soil resource inventory maps, including correlations between soil series and plant communities were used to determine the extent of wetlands in the project area. Following field verification, the GIS database was revised in order to generate wetland maps. These maps were used to quantify the acreage of wetlands in harvest units and along the road corridor.

## Wetlands in the Project Area

Extensive areas of wetlands are located in the project area. For purposes of description, the wetlands are classified and mapped based on vegetative cover type. The geomorphic categories as described by Brinson (1993) depressional, riverine, fringe, and peatlands, are useful in interpreting wetland function. Riverine wetlands are associated with streams and are represented by floodplains which support Sitka spruce/devils club forest community types and emergent sedge/tall shrub community types. Fringe wetlands are those that border a water body, such as along the lakes and salt water. Peatlands are the most extensive, occurring at all elevations across the project area. Sphagnum bogs and emergent sedge wetland types are associated with peatlands.

The biological significance of a wetland is related to the value of its functions, and at least in part to the relative scarcity of the wetland type in the landscape. This is especially true in terms of biological diversity on the landscape scale. The relatively scarce fens, estuarine salt marshes and lakes are assumed to have a greater biological significance than the more common bogs and forested wetlands which are widespread throughout the landscape.

In the project area, wetlands adjacent to water bodies were recognized as "important", primarily for the wildlife habitat they provide. Another area recognized as an important wetland is along a tributary to Canal Creek. Tall sedge meadows along the creek (a PA5 stream channel type) and muskeg uplands are heavily used by bear and beaver.

Wetlands cover approximately 12,200 acres of the project area. Wetland types present include coniferous forested wetlands (palustrine forested), mixed forest/muskeg wetlands (palustrine forested/palustrine emergent), sphagnum bogs or muskegs (palustrine emergent and palustrine scrub-shrub), estuarine wetlands (estuarine intertidal unconsolidated shore and estuarine intertidal emergent), alpine/subalpine wetlands.

## Forested Wetlands

Forested wetlands consist primarily of slope bogs supporting coniferous forests, some of which occur in a mosaic pattern with small open bogs. Tree cover ranges from a minimum of



10 percent to about 60 percent canopy cover. Tree height is at least 25 feet. Plant communities (Pawuk and Kissinger, 1989 ) consist primarily of Mixed Conifer/Blueberry/Skunk Cabbage, Mixed Conifer/Blueberry/Deer Cabbage, Western Hemlock/Blueberry/Skunk Cabbage, Shorepine/Blueberry, and some Mountain Hemlock/Blueberry/Skunk Cabbage. Soils are typically very poorly drained organic soils or poorly and very poorly drained mineral soils. There are 960 acres of this wetland type in the project area.

## **Forested Wetland/Forest Non-Wetland Complex**

Consists of a mixture of forest wetlands as described above and non-wetlands in a complex mosaic of microtopography that controls drainage and water regime. Approximately 500 acres of this wetland type are mapped in the project area. These areas make up the majority of wetland acres planned for timber harvest.

## **Forested Wetland/Sphagnum Peat Bog Complex**

These wetlands are a complex of forested wetlands as described above, and sphagnum bogs as described below. Approximately 1400 acres of this wetland type occurs in the project area.

## **Sphagnum Peat Bogs**

Sphagnum bogs, locally called muskegs, have deep peat soils. The high amount of free water reduces aeration necessary for organic matter decomposition resulting in the accumulation of peat deposits overtime. Soils are very poorly drained, moderately deep to deep, extremely acid peat soils. Tree cover is less than 10 percent, consisting mainly of stunted shore pine with lesser amounts of western hemlock, mountain hemlock, yellow cedar and Sitka spruce. Common shrubs include Labrador tea, crowberry, mountain cranberry, dwarf blueberry, bog laurel, and bog cranberry. These wetlands function as areas for recharge of groundwater and streams, and for deposition and storage of sediment and nutrients. There are approximately 1,600 acres of this wetland habitat in the area.

## **Emergent Sedge Wetlands**

Emergent sedge wetlands are open (non-forest) fens. Unlike bogs, shore pine are usually not present in fens. Oregon crab apple and highbush cranberry are common on the margins of fens. Soils are poorly and very poorly drained, and moderately deep to deep organic soils. Soil and water in fens typically are less acidic and have a higher nutrient content than sphagnum bogs. These organic soils typically contain some mineral soil material as thin strata of alluvium. These wetlands are more common in the Canal VCU than the Hoya VCU. They usually occur along streams or on the fringe of muskegs. Two-hundred acres of this wetland type are in the project area.

## **Alpine and Subalpine**

Subalpine wetlands as used here, are primarily high elevation (1800 to 2300 feet) bogs that occupy the sloping to steep summit of mountains. They are typically dominated by dwarf shrubs, low sedges and various forbs, especially deer cabbage. Trees include widely scattered stunted mountain hemlock, yellow cedar and less frequently shore pine. Shrubs include some alpine species typically yellow mountain heather, Merten's cassiope, luetkea and copperbush. Soils are typically poorly and very poorly drained shallow organic soils over bedrock. There are 7770 acres of alpine and subalpine habitat mapped in the project area, not all of which is wetland.

## **Salt or Marine Estuary**

Fourteen acres of salt marsh wetlands occupy the estuary area at the mouth of Hoya and Canal creek. These intertidal areas contain a variety of salt tolerant sedge communities arranged according to subtle differences in elevation and corresponding frequency of salt water inundation. The higher, less frequently inundated areas typically contain highly diverse grass/sedge/forb communities. Oregon crab apple and alder are found along the forest

### 3 Environment and Effects

fringe. Salt marshes have poorly drained mineral soils that have appreciably higher pH values and nutrient contents than other wetland types.

#### Effects on Wetlands

Because wetlands are so extensive in the project area, it is not feasible to avoid all wetland areas. However, there are no development activities planned on the more biologically significant wetlands. There would be no direct effects to the fens, estuarine wetlands, or the lake fringe wetlands. In all alternatives, roads and units were located to avoid these areas. Roads and other facilities would be constructed at least 1000' from estuaries, where feasible. Table 3-29 displays the length of road that would be constructed across the different wetland types.

Table 3-29  
Roads in Wetlands

| Wetland Type                                | Alt 2 | Alt 2 | Alt 3 | Alt 4 | Alt 5 |
|---|-------|-------|-------|-------|-------|
| Forested Wetland                            | .98   | .93   | .93   | .58   | 0     |
| Forested Wetland/Forest Non-Wetland Complex | .47   | .98   | 0     | 0     | 0     |
| Sphagnum Peat Bog                           | .54   | .41   | .41   | .1    | 0     |
| Sphagnum Bog/ Forested Wetland Complex      | 1.65  | 2.8   | 1.17  | .37   | 0     |
| Emergent Sedge Wetlands                     | .06   | .06   | 0     | 0     | 0     |

Table 3-30 displays the acres of harvest that is planned on the different wetland types.

Table 3-30  
Acres of Harvest on Wetlands

| Wetland Type                                | Alt 2 | Alt 2 | Alt 3 | Alt 4 | Alt 5 |
|---|-------|-------|-------|-------|-------|
| Subalpine                                   | 13.6  | 0     | 13    | 0     | 0     |
| Forested Wetland                            | 64    | 66    | 70    | 106   | 0     |
| Forested Wetland/Forest Non-Wetland Complex | 66    | 7     | 15    | 11    | 0     |
| Sphagnum Peat Bog                           | 1     | 1     | 1     | .9    | 0     |
| Sphagnum Bog/ Forested Wetland Complex      | 35    | 19    | 18    | 30    | 0     |
| Emergent Sedge Wetlands                     | 2.3   | 2.3   | .7    | 0     | 0     |

### Karst and Caves

#### Karst Features

During field surveys for this project, an effort was made to examine rock types for karst features wherever possible. In most forest and muskeg areas, the soil layer is too thick to allow easy observation of the underlying rocks. Exposed rock at high elevation, along stream channels, on steep slopes, and along the shoreline, as well as past geologic inventory, was the basis for determining the extent of the karst resources.

Karst features were located in the Canal VCU. The best expressed karst landscape features are located in the 2500-3400 foot elevation zone. Numerous collapsed sink holes were located in this area. Limestone bedrock exposures were also located in Canal creek about 1/2 mile from salt water, and on the peninsula extending to the west. It appears that a thin belt of crystalline limestone, as described by Buddington (1921), extends south from Blake Island across the Bradfield Canal and up into the subalpine zone of the Canal VCU. Surveys for caves were conducted in areas with carbonate bedrock, but none were located.

### **Effects on Karst**

All of the forested area known to have limestone bedrock is included in the Canal Old Growth Reserve, and will not be harvested. Units 42 and 44 lie in the path of the limestone belt; however, no limestone bedrock has been located in these units. No caves are known to occur in the project area, and consequently, no impacts are expected to occur to cave resources.

### **Sensitive Plants**

Surveys for sensitive plants were conducted through out the project area. No sensitive plants were located. The biological evaluation concluded that none of the action alternatives would have an impact on any sensitive plant species.

### **Other Findings**

The effects of the alternatives on consumers is reflected in the discussion of the various goods and services supplied as a result of the proposed alternatives (see Issue 1, Timber Economics and Supply, page 3-2). We have determined that the actions proposed in the alternatives would not adversely affect prime farm land, range land, rivers eligible for Wild and Scenic River designation, Class II Airshed standards associated with the Clean Air Act, or Wilderness, nor would it adversely impact civil rights, women or minorities.





# **Chapter 4**

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| Sitka Conservation Society                                |   |

# Glossary

## Access

The opportunity to approach, enter, and make use of public lands.

## Access Management

Acquiring rights and developing and maintaining facilities needed by people to get to and move through public lands (physical attributes).

## Adaptive Management

A continuous process of action-based planning, monitoring, research, evaluation, and adjustment with the objective of improving implementation and achieving desired management goals and objectives.

## Alaska National Interest Lands Conservation Act (ANILCA)

Passed by Congress in 1980, this legislation designated 14 National Forest wilderness areas in Southeast Alaska. The Alaska National Interest Lands Conservation Act of December 2, 1980. Public Law 96-487, 96th Congress, 94 Stat. 2371-2551. In Section 810 requires evaluations of subsistence impacts before changing the use of these lands.

## Alaska Native Claims Settlement Act (ANCSA)

Public Law 92-203, 92nd Congress, 85 Stat. 2371-2551. Approved December 18, 1971, ANCSA provides for the settlement of certain land claims of Alaska natives and for other purposes.

## Allowable Sale Quantity (ASQ)

ASQ refers to the maximum quantity of timber that may be sold each decade from the Tongass National Forest. This quantity, expressed as a board foot measure, is calculated per timber utilization standards specified in the Alaska Regional Guide, the number and type of acres available for timber management, and the intensity of timber management. The ASQ was calculated at 4.5 billion board feet per decade for the Tongass National Forest.

## Alluvial Fan

A cone-shaped deposit of organic and mineral material made by a stream where it runs out onto a level plain or meets a slower stream.

## Alluvium

Material deposited by rivers or streams, including the sediment laid down in river beds, floodplains and at the foot of mountain slopes and estuaries.

## Alpine

Parts of mountains above tree growth and/or the organisms living there.

## Alternative

One of several policies, plans, or projects proposed for decision making.

## Anadromous Fish

Anadromous fish (such as salmon, steelhead, and sea run cutthroat trout) spend part of their lives in freshwater and part of their lives in saltwater.

## Background

The distant part of a landscape. The seen or viewed area located from three or five miles to infinity from the viewer. (See "Foreground" and "Middleground".)

## Beach Fringe

The area inland from salt water shorelines, which is typically forested.

## Bedload

Sand, silt, and gravel, or soil and rock debris rolled along the bottom of a stream by the moving water.

## Best Management Practice (BMP)

Land management methods, measures, or practices intended to minimize or reduce water pollution. Usually BMPs are applied as a system of practices rather than a single practice. BMPs are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility,

## **Biological Diversity (Biodiversity)**

The variety of life in all its processes.

## **Blowdown**

See windthrow.

## **Board Foot (BF)**

A unit of wood 12" X 12" X 1". One acre of commercial timber in Southeast Alaska on the average yields 28,000-34,000 board feet per acre (ranging from 8,000-90,000 board feet per acre). One million board feet (MMBF) would be the volume of wood covering one acre two feet thick. One million board feet yields approximately enough timber to build 120 houses or 75,555 pounds of dissolving pulp.

## **Bole**

Trunk of the tree.

## **Braided Streams or Channels**

A stream flowing in several dividing and reuniting channels resembling the strands of a braid, the cause of division being the obstruction by sediment deposited by the stream.

## **Brush Disposal**

Cleanup and disposal of slash and other hazardous fuels within the forest or project areas.

## **Buffer**

Tongass Timber Reform Act (TTRA) requires that timber harvest be prohibited in an area no less than 100 feet on each side of all Class I streams and Class II streams which flow directly into Class I streams. This 100-foot area is known as a buffer.

## **Capability**

An evaluation of a resource's inherent potential for use.

## **Clearcut**

The harvesting in one cut of all trees on an area. The area harvested may be a patch, strip, or stand large enough to be mapped or recorded as a separate class in planning for sustained yield. Clearcut size on the Tongass National Forest is limited to 100 acres, except for specific conditions noted in the Alaska Regional Guide.

## **Coarse Woody Debris**

Any large piece of relatively stable woody material having a diameter of at least four inches and a length greater than three feet that intrudes into the stream channel. Also called Large Organic Debris (LOD).

## **Code of Federal Regulations (CFR)**

A codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government.

## **Commercial Fishery**

Fish, shellfish, or other fishery resources taken or processed within a designated area for commercial purposes

## **Commercial Forest Land (CFL)**

Productive Forest land that is producing or capable of producing crops of industrial wood and is not withdrawn from timber utilization by statute or administrative regulation. This includes areas suitable for management and generally capable of producing in excess of 20 cubic feet per acre of annual growth or in excess of 8,000 board feet net volume per acre. It includes accessible and inaccessible areas.

*Normal CFL:* Timber that can be economically harvested with locally available logging systems. Composed of two categories:

*Standard:* Timber that can be economically harvested with locally available logging systems, such as highlead or short-span skyline.



*Special:* Timber that is in areas where special consideration is needed to protect other resources but can be harvested with locally available logging systems.

*Non-standard CFL:* Timber that cannot be harvested with locally available logging systems and would require the use of other logging systems such as helicopter or long-span skyline.

## **Confluence**

The point where two streams meet.

## **Connectivity**

A measure of the extent that forest areas between or outside reserves provide habitat for breeding, feeding, dispersal, and movement.

## **Corridor**

Connective links of certain types of vegetation between patches of suitable habitat which are necessary for certain species to facilitate movement of individuals between patches of suitable habitat. Also refers to transportation or utility rights-of-way.

## **Cover**

Refers to trees, shrubs, or other landscape features that allow an animal to partly or fully conceal itself.

## **Critical Habitat**

Specific terrain within the geographical area occupied by threatened or endangered species. Physical and biological features that are essential to conservation of the species and which may require special management considerations or protection are found in these areas.

## **Crown**

The tree canopy. The upper part of a tree or woody plant that carries the main branch system and foliage.

## **Cruise**

Refers to the general activity of determining timber volumes and quality as opposed to a specific method.

## **Cultural Resources**

See Heritage Resources.

## **Cumulative Effects**

The impacts on the environment resulting from additional incremental impacts of past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions occurring over time.

## **Diameter Breast Height (DBH)**

The diameter of a tree measured 4 feet 6 inches from the ground.

## **Debris Avalanche**

The sudden movement downslope of the soil mantle; it occurs on steep slopes and is caused by the complete saturation of the soil from prolonged heavy rains. Also known as a debris slide.

## **Debris Flow**

A general term for all types of rapid movement of debris downslope.

## **Debris Torrents**

Landslides that occur as a result of debris; avalanche materials which either dam a channel temporarily or accumulate behind temporary obstructions such as logs and forest debris.

## **Deer Winter Range**

A combination of environmental elements that support Sitka black-tailed deer under moderately severe or severe winter conditions. Usually associated with high volume old-growth stands at low elevations and south aspects.

## **Developed Recreation**

Recreation that requires facilities that, in turn, result in concentrated use of an area. Facilities in these areas might include roads, parking lots, picnic tables, toilets, drinking water, and buildings.

## **Direct Employment**

Jobs that are immediately associated with a timber sale, including, for example, logging, sawmills, and pulpmills.

## **Dispersal**

The movement, usually one way, of plants and animals from their point of origin to another location where they subsequently produce offspring.

## **Distance Zone**

Areas of landscapes denoted by specified distances from the observer (foreground, middleground, or background). Used as a frame of reference in which to discuss landscape characteristics of management activities.

## **Diversity**

The distribution and abundance of different plant and animal communities and species within the area controlled by the Forest Plan.

## **Draft Environmental Impact Statement (DEIS)**

A statement of environmental effects for a major Federal action which is released to the public and other agencies for comment and review prior to a final management decision. Required by Section 102 of the National Environmental Policy Act (NEPA).

## **Eagle Nest Tree Buffer Zone**

A 330-foot radius around eagle nest trees established in an Agreement between the U.S. Fish and Wildlife Service and the Forest Service.

## **Ecological Province**

Twenty-one ecological subdivisions of Southeast Alaska that are identified by generally distinct ecological, physiographic, and biogeographic features. Plant and animal species composition, climate, and geology within each province are generally more similar within than among adjacent provinces. Historical events (such as glaciers and uplifting) are important to the nature of the province and to the barriers that distinguish each province.

## **Ecosystem**

A community of organisms and its physical setting. An ecosystem, whether a fallen log or an entire watershed, includes resident organisms, non-living components such as soil nutrients, inputs such as rainfall, and outputs such as organisms that disperse to other ecosystems.

## **Effects**

Effects, impacts, and consequences as used in this environmental impact statement are synonymous. Effects may be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historical, cultural, economic, or social, and may be direct, indirect, or cumulative.

*Direct Effects:* Results of an action occurring when and where the action takes place.

*Indirect Effects:* Results of an action occurring at a location other than where the action takes place and/or later in time, but in the reasonably foreseeable future.

*Cumulative Effects:* See Cumulative Effects.

## **Endangered Species**

Any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act. See also, threatened species, sensitive species.

## **Endemic**

Restricted to a particular locality. For example, a particular species or subspecies may occur on only one or a very few islands.

## **Erosion**

The wearing away of the land surface by running water, wind, ice, gravity, or other geological activities.

## **Estuary**

For the purpose of this EIS process, estuary refers to the relatively flat, intertidal, and upland areas generally found at the heads of bays and mouths of streams. They are predominately mud and grass flats and are unforested except for scattered spruce or cottonwood.

## **Even-Aged Stand Management**

The application of a combination of actions that result in the creation of stands in which trees of essentially the same age grow together. The difference in age between trees in forming the main canopy level of a stand usually does not exceed 20 percent of that age of the stand at harvest rotation age. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

## **Executive Order**

An order or regulation issued by the President or some administrative authority under his or her direction.

## **Fen**

A tract of low, wet ground containing sedge peat, relatively rich in mineral salts, alkaline in reaction, and characterized by slowly flowing water. Unlike peatlands (commonly referred to as bogs or muskegs), fens contribute to stable stream flows, provide nutrient input to streams and often contribute to fish rearing habitat.

## **Final Environmental Impact Statement (FEIS)**

The final version of the statement of environmental effects required for major federal actions under Section 102 of the National Environmental Policy Act. It is a revision of the draft environmental impact statement (DEIS) to include public and agency responses to the draft. The decision maker chooses which alternative to select from the Final EIS, and subsequently issues a Record of Decision (ROD).

## **Fiscal Year (FY)**

October 1 through September 30, e.g. October 1, 1992 - September 30, 1993 = FY93.

## **Floodplain**

That portion of a river valley, adjacent to the river channel, which is covered with water when the river overflows its banks at flood stages.

## **Forbs**

Herbaceous plants; generally smaller flowering plants. Not included in the grass, shrub or tree categories.

## **Foreground**

The stand of trees immediately adjacent to a scenic area, recreation facility, or forest highway; area located less than 1/4 mile from the viewer. See also, Background and Middleground.

## **Forest and Rangeland Renewable Resources Planning Act of 1976 (RPA)**

Amended in 1976 by the National Forest Management Act. See RPA Assessment and Program.

## **Forest or Forest Land**

National Forest lands currently supporting or capable of supporting forests at a density of 10 percent crown closure or better. Includes all areas with forest cover, including old growth and second growth, and both commercial and non-commercial forest land.

## **Forested Habitat**

All areas with forest cover. Used in this EIS to represent a general habitat zone.

## **Forested Wetland**

A wetland whose vegetation is characterized by an overstory of trees that are 20 feet or taller.

## **Forest Plan**

The Tongass Land Management Revision, signed in 1997. This is the 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning, the daily uses, and the activities carried out within the forest.



## **Fragmentation**

An element of biological diversity that describes the natural condition of habitats in terms of the size of discrete habitat blocks or patches, their distribution, the extent to which they are interconnected, and the effects of management on these natural conditions. Also the process of reducing the size and connectivity of stands within a forest.

## **FSH**

Forest Service Handbook.

## **FSM**

Forest Service Manual.

## **Geographic Information System (GIS)**

An information processing technology to input, store, manipulate, analyze, and display spatial and attribute data to support the decision-making process. It is a system of computer maps with corresponding site specific information that can be electronically combined to provide reports and maps.

## **Group Selection**

Small groups of trees up to 2 acres in size are harvested.

## **Guideline**

A preferred or advisable course of action or level of attainment designed to promote achievement of goals and objectives.

## **Habitat**

The sum total of environmental conditions of a specific place occupied by an organism, population, or community of plants and animals.

## **Habitat Capability**

The estimated number of healthy animals that a habitat can sustain. Often shown as a relative percentage of optimum habitat conditions.

## **Habitat Suitability Index**

This is a value assigned to a unit of land using a computerized model that relates vegetative and geographic characteristic (e.g. stand volume, proximity to a stream or cliff, slope, aspect, etc.) to the land unit's value for a particular wildlife species. Values range from 0 to 1, with 1 being the best. The Habitat Capability Models used to generate HSIs were developed by interagency teams of biologists using the best available information including research results and best professional judgement.

## **Habituation**

A reduction in the frequency or strength of response following repeated exposure to inconsequential stimulus. In the case of bears at Anan, if people are repeatedly encountered in non-threatening situations, the bears become used to the people and react less over time.

## **Haul out**

An area of large, smooth rocks used by seals and sea lions for resting and pupping.

## **Heritage Resources**

Also known as Cultural Resources. Historic or prehistoric objects, sites, buildings, structures, and their remains, resulting from past human activities.

## **Humus**

Substance of organic origin that is fairly but not entirely resistant to further bacterial decay.

## **Hydrophyte**

Plants typically found in wet habitats.

## **Important Subsistence Use Area**

Important Subsistence Use Areas include the "most -reliable" and "most often hunted" categories from the TRUCS survey and from subsistence survey data from ADFG, the University of Alaska, and the Forest Service, Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

## **Indirect Employment**

The jobs in service industries that are associated with a timber sale including, for example, suppliers of logging and milling equipment.

## **Infrastructure**

The facilities, utilities, and transportation systems needed to meet public and administrative needs.

## **Inoperable Timber**

Timber that cannot be harvested by any proven method because of potential resource damage, extremely adverse economic considerations, or physical limitations.

## **Interception**

The process by which precipitation is caught and held by foliage, twigs, and branches of trees, shrubs, and other vegetation, and lost by evaporation, never reaching the surface of the ground.

## **Interdisciplinary Team (IDT)**

Two or more natural resource planners who use relevant information to develop alternative design and comparison for a proposed project. The team insures that integrated use of environmental, social, and economic information is clearly presented so the best decision can be made.

## **Intermediate Stand Treatments**

A stand management treatment which manipulates stand growth, composition, structure, or tree quality. Intermediate treatments include thinning, pruning, clearing, weeding, liberation, release, improvement, salvage, and sanitation cutting to achieve different management objectives. These stand treatments do not attempt to obtain new tree regeneration, and they occur before the final regeneration harvest. Some treatments such as salvage cutting or commercial thinning result in the harvest of forest products.

## **Invertebrates**

Animals without a backbone.

## **Irretrievable Commitments**

Losses of production or use of renewable natural resources for a period of time. For example, timber production from an area is irretrievably lost during the time an area is allocated to a no-harvest prescription; if the allocation is changed to allow timber harvest, timber production can be resumed. The production lost is irretrievable, but is not irreversible.

## **Irreversible Commitments**

Decisions causing changes which cannot be reversed. For example, if a roadless area is allocated to allow timber harvest and timber is actually harvested, that area cannot, at a later date, be allocated to wilderness. Once harvested, the ability of that area to meet wilderness criteria has been irreversibly lost. Often applies to nonrenewable resources such as minerals and cultural resources.

## **Issue**

A point, matter, or section of public discussion or interest to be addressed or decided.

## **Karst**

A type of topography that develops in areas underlain by soluble rocks, primarily limestone. Dissolution of the subsurface strata results in areas of well-developed surface drainage that are sinkholes, collapsed channels, or caves.

## **Knutson-Vandenburg Fund (KV)**

The portion of timber sale receipts collected and used for reforestation and other renewable resource projects on the sale area.

## **Landslides**

The moderately rapid to rapid down slope movement of soil and rock materials that may or may not be water-saturated.

## **Log Transfer Facility (LTF)**

A facility that is used for transferring commercially harvested logs to and from a vessel or log raft, or the formation of a log raft. It is wholly or partially constructed in waters of the United States and location and construction are regulated by the 1987 Amendments to the Clean Water Act. Formerly termed "terminal transfer facility" or "log dump".

## **Logging Systems**

*Cable:* Ground based yarding of logs using a steel cable to pull logs to a landing.

*Helicopter:* Flight path cannot exceed 40 percent downhill or 30 percent uphill; landings must be selected so there is adequate room for the operation and so that the helicopter can make an upwind approach to the drop zone.

## **Logging Camp**

A temporary facility established to house industry and Forest Service personnel while timber harvest occurs in the area.

## **MBF**

A thousand board feet net sawlog and utility volume.

## **MMBF**

A million board feet net sawlog and utility volume.

## **Management Indicator Species (MIS)**

Species selected in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.

## **Management Prescriptions**

Method of classifying land uses presented in the Forest Plan. Replaces the Land Use Designations (LUDs) originally presented in TLMP.

## **Market Pond Value**

Also known as pond log value. Selling value minus manufacturing costs. Pond log values are the price a timber buyer would pay for a log at the mill site.

## **Mass Failure**

The downslope movement of a block or mass of soil. This usually occurs under conditions of high-soil moisture and does not include individual soil particles displaced as surface erosion.

## **Maritime Climate**

Weather conditions controlled by an oceanic environment characterized by small annual temperature ranges and high precipitation.

## **Memorandum of Understanding (MOU)**

A legal agreement between the Forest Service and others agencies resulting from consultation between agencies that states specific measures the agencies will follow to accomplish a large or complex project. A memorandum of understanding is not a fund obligating document.

## **Middleground**

The visible terrain beyond the foreground where individual trees are still visible but do not stand out distinctly for the landscape; area located from 1/4 to 5 miles from the viewer. See also, Foreground and Background.

## **Mineral Soils**

Soils consisting predominately of, and having its properties determined by, mineral material.

## **Minimum Viable Population**

A population with the estimated numbers and distribution of reproductive individuals to maintain the population over time.

## **Mitigation**

Measures designed to counteract environmental impacts or to make impacts less severe. These may include: avoiding an impact by not taking a certain action or part of an action; minimizing an impact by limiting the degree or magnitude of an



action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or compensating for the impact by replacing or providing substitute resources.

## **Mixed Conifer**

In Southeast Alaska, mixed conifer stands usually consist of western hemlock, mountain hemlock, Alaska yellowcedar, Western redcedar, and Sitka spruce species. Shorepine may occasionally be present.

## **Model**

A representation of reality used to describe, analyze, or understand a particular concept. A model may be a relatively simple qualitative description of a system or organization, or a highly abstract set of mathematical equations. A model has limits to its effectiveness, and is used as one of several tools to analyze a problem.

## **Monitoring**

A process of collecting information to evaluate whether or not objectives of a project and its mitigation plan are being realized. Monitoring can occur at different levels: to confirm whether mitigation measures were carried out in the manner called for, to determine whether the mitigation measures were effective, or to validate whether overall goals and objectives were appropriate. Different levels call for different methods of monitoring.

## **Multiple-aged Stands**

An intermediate form of stand structure between even and uneven-aged stands. These stands generally have two or three distinct tree canopy levels occurring within a single stand.

## **Multiple Entry**

More than one stand or land treatment activity during a rotation of a stand or area.

## **Multiple Use**

The management of all the various renewable resources of the National Forest System to be used in the combination that will best met the needs of the American people.

## **Muskeg**

In Southeast Alaska a type of bog that has developed over thousands of years in depressions or flat areas on gentle to steep slopes. Also called peatlands.

## **National Environmental Policy Act (NEPA) of 1969**

An Act to declare a national policy which will encourage productive and enjoyable harmony between humankind and the environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the Nation, and to establish a Council on Environmental Quality (The Principal Laws Relating to Forest Service Activities, agric. Handb. 453. USDA Forest Service, 359 p.).

## **National Forest Management Act (NFMA)**

A law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

## **National Wild and Scenic River System**

Rivers with outstanding scenic, recreational, geological, fish and wildlife, historic, cultural, or other similar values designated by Congress under the Wild and Scenic Rivers Act of 1968 and amended in 1986, for preservation of their free-flowing condition. May be classified and administered under one or more of the following categories: Wild, Scenic, and/or Recreational.

## **Net Sawlog Volume**

Tree or log volume suitable in size and quality to be processed into lumber. In Southeast Alaska, depending on the market, the volume may be processed as pulp or lumber.

## **No-action Alternative**

The most likely condition expected to exist in the future if current management direction were to continue unchanged.

## **Non-commercial Forest Land**

Land with more than 10 percent cover of commercial tree species but not qualifying as Commercial Forest land.

## **Non-Forest Land**

Land that has never supported forests and lands formerly forested but now developed for such nonforest uses as crops, improved pasture, etc.

## **Non-interchangeable Components (NIC's)**

Increments of the suitable land base and their contribution to the allowable sale quantity (ASQ) that are established to meet Forest Plan objectives. NIC's are identified as parcels of land and the type of timber thereon which are differentiated for the purpose of Forest Plan implementation. The total ASQ is derived from the sum of the timber volumes from all NIC's. The NIC's cannot be substituted for each other in the timber sale program.

**NIC I. Normal Operability:** This is volume scheduled from suitable lands using existing logging systems. Most of these lands are expected to be economic under projected market conditions. On average, sales from these lands have the highest probability of offering a reasonable opportunity for a purchaser to gain a profit from his/her investment and labor. This is the best operable ground.

**NIC II. Difficult and Isolated Operability:** This is volume scheduled from suitable lands that are available for harvest using logging systems not in common use in Southeast Alaska. Most of these lands are presently considered economically and technologically marginal. Difficult operability in the Canal Hoya Project Area would include helicopter yarding distances greater than three-quarters of a mile. Isolated operability stands are extremely difficult and costly to harvest, due to terrain or helicopter yarding distances greater than one mile.

## **Notice of Intent (NOI)**

A notice printed in the Federal Register announcing that an Environmental Impact Statement will be prepared. The NOI must describe the proposed action and possible alternatives, describe the agency's proposed scoping process, and provide a contact person for further information.

## **Objectives**

The precise steps to be taken and the resources to be used in achieving goals.

## **Offering**

A Forest Service specification of timber harvest units, subdivisions, roads, and other facilities and operations to meet the requirements of a contract.

## **Old Growth**

Ecosystems distinguished by old trees and related structural attributes. Old-growth forests are characterized by larger tree size, higher accumulations of large dead woody material, multiple canopy layers, different species composition, and different ecosystem function. The structure and function of an old-growth ecosystem will be influenced by its stand size and landscape position and context. For the displays in this project, it is those areas typed as Volume Class 4, 5, 6, and 7.

## **Old-Growth Habitat**

Wildlife habitat managed to maintain old-growth forest characteristics through the planning period.

## **Organic Soils**

Soils that contain a high percentage (generally greater than 20 to 30 percent) of organic matter throughout the soil depth.

## **Partial Cut**

Method of harvesting trees where any number of live stems are left standing in any of various spatial patterns. Not clearcutting. Can include seed tree, shelterwood, or other methods.

## **Patch**

A non-linear surface area differing in appearance from its surroundings.

## **Peak flow**

The highest discharge of water recorded over a specified period of time at a given stream location. Often thought of in terms of spring snowmelt, summer, fall, or winter rainy season flows. Also called maximum flow.

## **pH**

The degree of soil acidity or alkalinity.

## **Planning Record**

A system that records decisions and activities that result from the process of developing a forest plan, revision, or significant amendment.

## **Plant Association**

Climax plant community type.

## **Plant Communities**

Aggregations of living plants having mutual relationships among themselves and to their environment. More than one individual plant community.

## **Population Viability**

Ability of a population to sustain itself.

## **Precommercial Thinning**

An intermediate stand treatment in even-aged stands which removes immature or undesirable trees to reduce competition so remaining trees can more fully utilize site potential and remain in a healthy condition.

## **Process Group**

A combination of similar channel types based on major differences in landform, gradient, and channel shapes.

## **Productive Old Growth**

Old-growth forest capable of producing at least 20 cubic feet of wood fiber per acre per year, or having greater than 8,000 board feet per acre.

## **Public Participation**

Meetings, conferences, seminars, workshops, tours, written comments, responses to survey questionnaires, and similar activities designed and held to obtain comments from the public about Forest Service activities.

## **Record of Decision**

A document separate from but associated with an Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not.

## **Reforestation**

The natural or artificial restocking of an area with trees.

## **Regeneration**

The process of establishing a new crop of trees on previously harvested land.

## **Regional Guide**

The guide developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974 as amended. It guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands within a given region.

## **Rehabilitation**

Actions taken to protect or enhance site productivity, water quality, or other values for a short period of time.

## **Resident Fish**

Fish that are not anadromous and that reside in freshwater on a permanent basis. Resident fish include non-anadromous Dolly Varden char and cutthroat trout.

## **Reserve Trees**



Live or dead trees that are retained for various resource objectives such as wildlife, structural diversity, etc.

## **Resident Fish**

Fish that are not migratory and complete their entire life cycle in fresh water.

## **Resource values**

The tangible and intangible worth of forest resources.

## **Responsible Official**

The Forest Service employee who has the delegated authority to make a specific decision.

## **Revegetation**

The re-establishment and development of a plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through the direct action of reforestation or reseeding.

## **Revised Forest Plan**

The Tongass Land Management Revision, signed in 1997. This is the 10-year land allocation plan for the Tongass National Forest that directs and coordinates planning, the daily uses, and the activities carried out within the forest.

## **Riparian Area**

Geographically deniable area with distinctive resource values and characteristics that contain elements of aquatic and riparian ecosystems.

## **Riparian Ecosystem**

Land next to water where plants that are dependent on a perpetual source of water occur.

## **Roads**

*Specified:* Roads usually developed and operated for long-term land and resource management purposes to constant service.

*Temporary:* For National Forest timber sales, temporary roads are constructed to harvest timber on a one-time basis.

These logging roads are not considered part of the permanent Forest transportation network and have stream crossing structures removed, erosion measures put into place, and the road closed to vehicular traffic after harvest is completed.

## **Roadless Area**

An area of undeveloped public land within which there are no improved roads maintained for travel by means of motorized vehicles intended for highway use.

## **Rotation**

The planned number of years (approximately 100 years in Alaska) between the time that a Forest stand is regenerated and its next cutting at a specified stage of maturity.

## **Salvage Cutting**

Cutting primarily to utilize dead/down material resulting from windthrow and scattered poor risk trees that will not be marketable if left in the stand until the next scheduled harvest. Salvage sales must contain more than 50 percent by volume of dead, insect infested, or windthrown timber.

## **Sawlog**

That portion of a tree that is suitable in size and quality for the production of dimension lumber collectively known as sawtimber.

## **Scoping Process**

Early and open activities used to determine the scope and significance of a proposed action, what level of analysis is required, what data is needed, and what level of public participation is appropriate. Scoping focuses on the issues surrounding the proposed action, and the range of actions, alternatives, and impacts to be considered in an EA or an EIS.

## **Scrub-Shrub Wetland**

Wetlands dominated by woody vegetation less than 20 feet tall. The species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions. In Southeast Alaska this includes forested lands where trees are stunted because of poor soil drainage.

## **Second Growth**

Forest growth that has become established following some disturbance such as cutting, serious fire, or insect attack; even-aged stands that will grow back on a site after removal of the previous timber stand.

## **Sediment**

Solid material, both mineral and organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.

## **Sensitive Species**

Plant and animal species which are susceptible or vulnerable to activity impacts or habitat alterations. Those species that have appeared in the Federal Register as proposed for classification or are under consideration for official listing as endangered or threatened species, that are on a non-official State list, or that are recognized by the regional forester as needing special management to prevent placement on Federal or state lists.

## **Seral**

Early stage of succession.

## **Silviculture**

The branch of forestry involving the theory and practice of manipulating the establishment, composition, structure, and growth of forest vegetation. Silviculture involves the appropriate application of ecological, social, and economic principles of vegetative management to achieve resource management objectives and desired future forest conditions.

## **Silvicultural Prescription**

A written technical document which provides detailed implementation direction about methods, techniques, timing, and monitoring or vegetative treatments. A prescription is prepared after a preferred treatment alternative has been selected, but before the project is implemented. A prescription is prepared by a silviculturist who uses interdisciplinary input to best achieve established objectives, direction, and requirements for land managed by the USDA Forest Service.

## **Site Preparation**

Manipulation of the vegetation or soil of an area prior to planting or seeding. The manipulation follows harvest, wildfire, or construction in order to encourage the growth of favored species. Site preparation may include the application of herbicides, burning, or cutting of living vegetation that competes with the favored species; tilling the soil; or burning of organic debris (usually logging slash) that makes planting or seeding difficult.

## **Site Productivity**

Production capability of specific areas of land.

## **Slash**

Debris left over after a logging operation; i.e. limbs, bark, broken pieces of logs.

## **Smolt**

Young silvery-colored salmon or trout which move from freshwater streams to saltwater.

## **Snag**

A standing dead tree, usually greater than 5 feet tall and 6 inches in diameter at breast height.

## **Soil Productivity**

The capacity of a soil, in its normal environment, to produce a specific plant or sequence of plants under a specific system of management.

## **Soil Resource Inventory (SRI)**

An inventory of the soil resource based on landform, vegetative characteristics, soil characteristics, and management potentials.

## **Spawning Area**

The available area in a stream course which is suitable for the deposition and incubation of salmon or trout eggs.

## **Special Habitats**

Structural elements of ecosystems. These may include, but are not limited to: snags, spawning gravels, fallen trees, aquatic reefs, caves, seeps, and springs.

## **Species Diversity**

The number of different species occurring in a location or under a similar environmental condition.

## **Split Yarding**

The process of separating the direction of timber harvest yarding into opposite directions.

## **Stand (Tree Stand)**

An aggregation of trees occupying a specific area and sufficiently uniform in composition, age arrangement, and condition as to be distinguishable from the forest in adjoining areas.

## **Standard**

A course of action or level of attainment required by the forest plan to promote achievement of goals and objectives.

## **State Historic Preservation Officer (SHPO)**

State appointed official who administers Federal and State programs for cultural resources.

## **Stocking**

The degree of occupancy of land by trees as measured by basal area or number of trees and as compared to a stocking standard; that is, the basal area or number of trees required to fully use the growth potential of the land.

## **Structural Diversity**

The diversity of forest structure, both vertically and horizontally, which provides for a variety of forest habitats such as logs and multi-layered forest canopy for plants and animals.

## **Stumpage**

The value of timber as it stands uncut in terms of dollar value per thousand board feet.

## **Study Area**

The area of the National Forest System controlled by a decision document.

## **Subsistence**

The term "subsistence uses" means the customary and traditional uses by rural Alaska residents of wild renewable resources for direct, personal, or family consumption as food, shelter, fuel, clothing, tools, or transportation; for the making and selling of handicraft articles out of non-edible byproducts of fish and wildlife resources taken for personal or family consumption; and for customary trade.

## **Subsistence Use Area**

Important Subsistence Use Areas include the "most reliable" and "most often hunted" categories from the Tongass Resource Use Cooperative Survey (TRUCS) and from subsistence survey data from ADFG, the University of Alaska, and the Forest Service, Region 10. Important use areas include both intensive and extensive use areas for subsistence harvest of deer, furbearers, and salmon.

## **Substantive Comment**

A comment that provides factual information, professional opinion, or informed judgement germane to the action being proposed.

## **Substrate**

The type of material in the bed (bottom) of rivers and streams.

## **Succession**



The ecological progression of community change over time, characterized by displacements of species leading towards a stable climax community.

### **Suitable Forest Land**

Commercial Forest land identified as having both the biological capability and availability to produce industrial wood products.

### **Suitability**

An evaluation based upon a resource's potential use within proposed management activities.

### **Suitable Forest land**

Forest land for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity, or watershed conditions, and for which there is reasonable assurance that such lands can be adequately restocked, and for which there is management direction that indicated that timber production is an appropriate use of that area.

### **Sustained Yield**

The amount of renewable resources that can be produced continuously at a given intensity of management.

### **Swale**

A slight, marshy depression in generally level land. A depression in glacial ground moraine.

### **Thinning**

The practice of removing some of the trees in a stand so that the remaining trees will grow faster due to reduced competition for nutrients, water, and sunlight. Thinning may also be done to change the characteristics of a stand or wildlife or other purposes. Thinning may be done at two different stages.

### **Threatened Species**

Plant or animal species which is likely to become endangered throughout all or a significant portion of its range within the foreseeable future, as defined in the Endangered Species Act of 1973, and which has been designated in the Federal Register by the Secretary of the Interior as a threatened species. (See also, endangered species, sensitive species.)

### **Threshold**

The point or level of activity beyond which an undesirable set of responses begins to take place within a given resource system.

### **Timber Classification**

Forested land is classified under each of the land management alternatives according to how it relates to be management of the timber resource. The following are definitions of timber classifications used for this purpose.

*Nonforest:* Land that has never supported forests and land formerly forested where use for timber production is precluded by development or other uses.

*Forest:* Land at least 10-percent stocked (based on crown cover) by forest trees of any size, or formerly having had such tree cover and not currently developed for nonforest use.

*Suitable or suitable available:* Land to be managed for timber production on a regulated basis.

*Unsuitable:* Forest land withdrawn from timber utilization by statute or administrative regulation (for example, wilderness), or identified as inappropriate for timber production in the Forest planning process.

*Commercial forest:* Forest land tentatively suitable for the production of continuous crops of timber and that has not been withdrawn.

### **Timber Harvest Unit**

A "Timber Harvest Unit" is an area within which Forest Service specifies for harvest all or part of the timber.

### **Timber Stand Improvement (TSI)**

All noncommercial intermediate cutting and other treatments to improve composition, condition, and volume growth of a timber stand.

### **Tongass Land Management Plan (TLMP)**

See Forest Plan

## **Turbidity**

An indicator of the amount of sediment suspended in water.

## **Understory**

The trees and shrubs in a forest growing under the canopy or overstory.

## **Unsuitable**

Forest land withdrawn from timber utilization by statute or administrative regulation; for example, wilderness, or identified as not appropriate for timber production in the forest planning process.

## **Utility Logs**

Those logs that do not meet sawlog grade but are suitable for production of firm useable pulp chips.

## **VAC**

See Visual Absorption Capability.

## **Value Comparison Unit (VCU)**

Areas which generally encompass a drainage basin containing one or more large stream systems; boundaries usually follow easily recognizable watershed divides. Established to provide a common set of areas where resource inventories could be conducted and resource interpretations made.

## **Viable Population**

The number of individuals of a species required to ensure the long-term existence of the species in natural, self-sustaining populations adequately distributed throughout their region.

## **Viewshed**

An expansive landscape or panoramic vista seen from a road, marine water way, or specific viewpoint.

## **Visual Quality Objectives (VQO)**

A desired level of scenic quality and diversity of natural features based on physical and sociological characteristics of an area. Refers to the degree of acceptable alterations of the characteristic landscape.

*Preservation:* Permits ecological changes only. Applies to wilderness areas and other special classified areas. Management activities are generally not allowed in this setting.

*Retention:* Provides for management activities that are not visually evident to the casual Forest visitor.

*Partial Retention:* Management activities remain visually subordinate to the natural landscape.

*Modification:* Management activities may visually dominate the characteristics landscape. However, activities must borrow from naturally established form-line color and texture so that the visual characteristics resemble natural occurrences within the surrounding area when viewed in the middleground distance.

*Maximum Modification:* Management activities may dominate the landscape but should appear as a natural occurrence when viewed as background.

## **V-Notches**

A deeply incised valley along some waterways that would look like a "V" from a cross-section. These abrupt changes in terrain features are often used as harvest unit or yarding boundaries.

## **Volume**

Stand volume based on standing net board feet per acre by Scribner Rule.

## **Volume Strata**

Divisions of old-growth timber volume derived from the interpreted timber type data layer (TIMTYP) and the common land unit data layer (CLU). Three volume strata (low, medium, and high) are recognized in the Forest Plan.

## **Watershed**

The area that contributes water to a drainage or stream. Portion of the forest in which all surface water drains to a common point. Watersheds can range from a few tens of acres that drain a single small intermittent stream to many thousands of acres for a stream that drains hundreds of connected intermittent and perennial streams.

## **Wetland**

Areas that are inundated by surface or groundwater frequently enough to support vegetation that requires saturated or seasonally saturated soil conditions for growth and reproduction. Wetlands generally include: swamps, marshes, bogs, and similar areas such as sloughs, potholes, wet meadows, river overflows, mudflats, and natural ponds.

## **Wilderness**

Areas designated by congressional action under the 1964 Wilderness Act. Wilderness is defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or humans habitation. Wilderness areas are protected and managed to preserve their natural conditions, which generally appear to have been affected primarily by the forces of nature, with the imprint of human activity substantially unnoticeable; have outstanding opportunities for solitude or a primitive and unconfined type of recreation; areas of at least 5,000 acres are of sufficient size to make practical their preservation, enjoyment, and use in an unimpaired condition; and may contain features of scientific, educational, scenic, or historical value as well as ecologic and geologic interest. In Alaska, Wilderness has been designated by ANILCA and TTRA.

## **Wildlife Analysis Area (WAA)**

A division of land used by the Alaska Department of Fish and Game for wildlife analysis.

## **Wildlife Habitat**

The locality where a species may be found and where the essentials for its development and sustained existence are obtained.

## **Windfirm**

Trees that have been exposed to the wind throughout their life and have developed a strong root system or trees that are protected from the wind by terrain features.

## **Windthrow**

The act of trees being uprooted by the wind. In Southeast Alaska, Sitka spruce and hemlock trees are shallow rooted and susceptible to windthrow. There generally are three types of windthrow:

*Endemic:* where individual trees are blown over;

*Catastrophic:* where a major windstorm can destroy hundreds of acres; and

*Management Related:* where the clearing of trees in an area make the adjacent standing trees vulnerable to windthrow.

## **Winter Range**

An area, usually at lower elevation, used by big game during the winter months; usually smaller and better-defined than summer ranges.

## **Yarding**

Hauling timber from the stump to a collection point.



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# **Appendix A**

## **Unit Cards and Extra Alternative Maps**





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# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 1      In Alternatives 1, 3, & 4

Harvest method Helicopter

Total Acres 22

Volume per Acre 22.4 MBF

Total Unit Volume 493 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality object of partial retention. Boundary stays off of steep cliffs to southeast side of the unit. Northwest boundary skirts the edge of some old blowdown.

Stand Management Objectives:      Future stand to have several canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation.

Silvicultural Prescription:      Harvest unit while leaving a mix of species, about 10% of the total trees per acre will be left in Alternatives 1 & 4. About 20% of the total trees per acre will be left in Alternative 3. Diameter limit will meet stand management objectives.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, possible planting, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Class IV stream in unit and along southwestern boundary.

Mitigation:      Streamcourse protection accomplished by helicopter yarding.

### Soils

Concern:      Oversteepened slopes adjacent to unit.

Mitigation:      Avoid harvest on steep slopes on northwest and southeast side of unit. Soil disturbance minimized by helicopter yarding.

### Wildlife

Concern:      Connection between large forested blocks.

Mitigation:      Leave trees in the unit and the presence of the beach buffer.

### Visuals

Concern:      Appearance of unit from Bradfield Canal.

Mitigation:      Leave trees in unit.

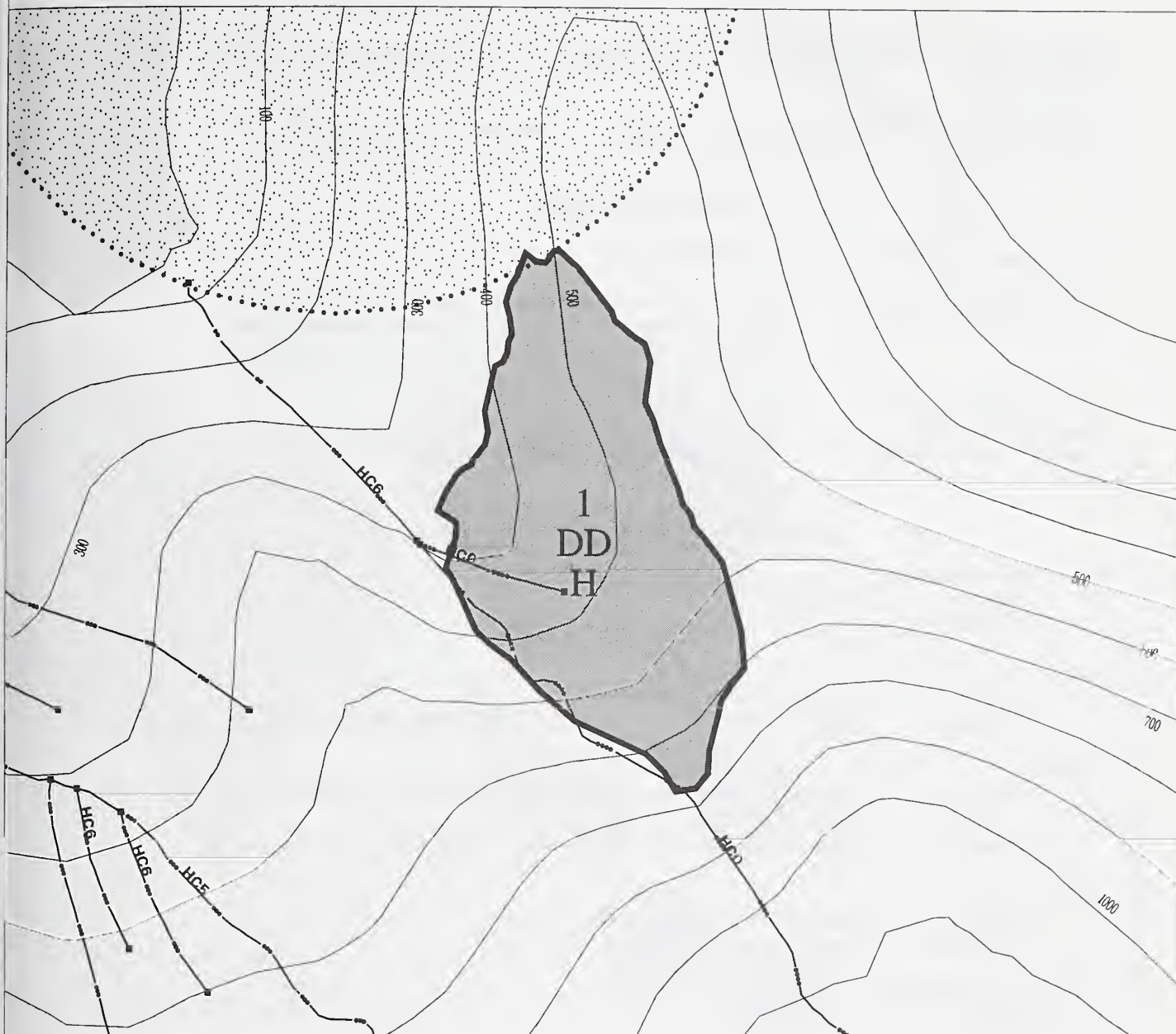
### Special Contract Concerns

None

UNIT 1

ALTERNATIVE 1, 3 & 4

22 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

## PRESCRIPTIONS

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

## HARVEST SYSTEMS

C = Cable  
H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 2

In Alternatives 1, 2, & 3

Harvest method Cable

Total Acres 18

Volume per Acre 19.8 MBF

Total Unit Volume 356 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding system.

Stand Management Objectives: Future stand to have several canopy layers. Stand will have at least two different age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. About 25% will be left.

Silvicultural Prescription: Clearcut with clumps of trees left in the unit.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: No concerns.

Mitigation:

### Soils

Concern: Harvest on oversteepened slopes.

Mitigation: Adjust boundaries to avoid harvest on slopes steeper than 72% slope.

### Wildlife

Concern: Dispersal of small mammals. Loss of large trees for nesting/denning. Fragmentation.

Mitigation: Place reserves within the unit to maintain structural diversity.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in clumps.

### Special Contract Concerns:

None

UNIT 2

ALTERNATIVE 1, 2 & 3

18 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

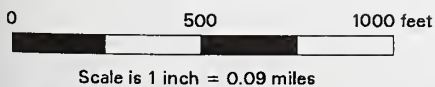
- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

HARVEST SYSTEMS  
 C = Cable  
 H = Helicopter



Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 2

In Alternative 4

Harvest method Helicopter

Total Acres 26

Volume per Acre 18.3 MBF

Total Unit Volume 477 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality object of partial retention. Unit modified to buffer Class III streams.

Stand Management Objectives: Future stand to have several canopy layers. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. Harvest unit while leaving a mix of species, retaining about 25%.

Silvicultural Prescription: Diameter limit.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class III streams (HC6) tributary to Hardrock Creek. Class IV streams in Unit.

Mitigation: No harvest within notch of Class III streams. Helicopter yarding protects Class IV streams.

### Soils

Concern: Avoid steep slopes and V-notches.

Mitigation: Full suspension accomplished by helicopter yarding.

### Wildlife

Concern: Travel corridor to beach.

Mitigation: Structure maintained with leave trees and stream buffers.

### Visuals

Concern: Appearance of Unit from Bradfield Canal.

Mitigation: Leaving trees in clumps using individual tree marking.

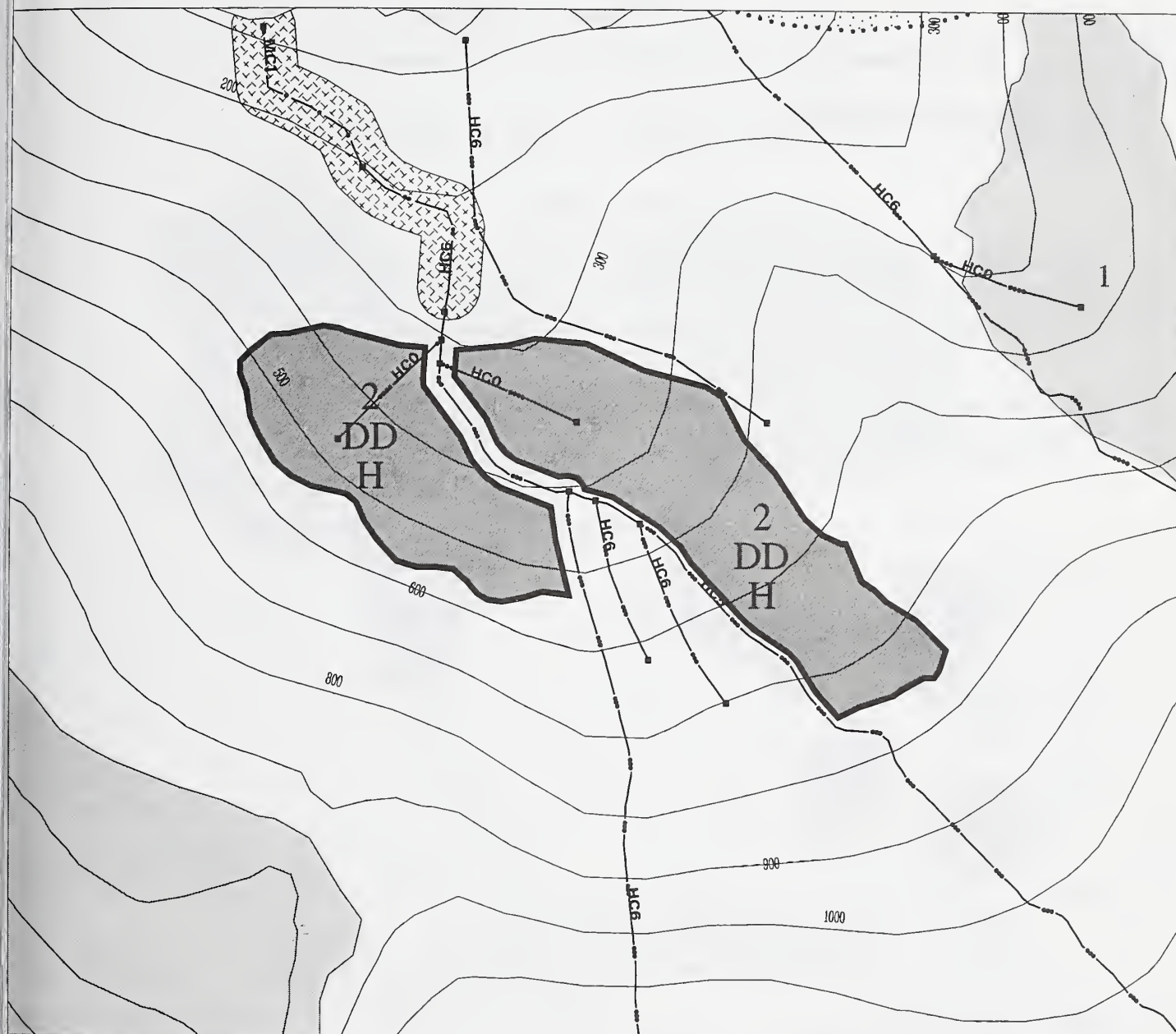
Special Contract Concerns:



UNIT 2

ALTERNATIVE 4

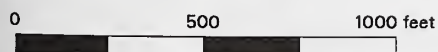
26 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types



Scale is 1 inch = 0.09 miles

★ Eagle Nest Tree

Proposed cut units

Adjacent proposed units

TTRA Buffers

1/4 Mile Eagle Nest Timing Buffers

## PRESCRIPTIONS

CC = Clearcut

DD = Diameter Limits

PP = Patch Cut

## HARVEST SYSTEMS

C = Cable

H = Helicopter

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**      Unit Number   3        In Alternative   1  

Harvest method Cable and Helicopter

Total Acres 40

Volume per acre 13 MBF

Total Unit Volume 522 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with cable for larger block and helicopter yarding of patches. Unit stays off oversteepened soils . Unit has stream along west edge. Backline is feathered into remaining timber.

Stand Management Objectives:      Unit with 10% retention in cable portion and 5% retention in the helicopter portion. Unit will be predominately even aged with two canopy levels.

Silvicultural Prescription      Clearcut with retention and Diameter limits

Regeneration Method      Natural

Possible Future Treatments:      Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern;      Stream along west side of unit.  
Mitigation      Provide protection for stream.

### Soils

Concern:  
Mitigation:

### Wildlife

Concern  
Mitigation

### Visuals

Concern      Appearance of unit from Bradfield Canal.  
Mitigation      Retention in unit and diameter limit on upper portion of unit should accomplish the visual objective.

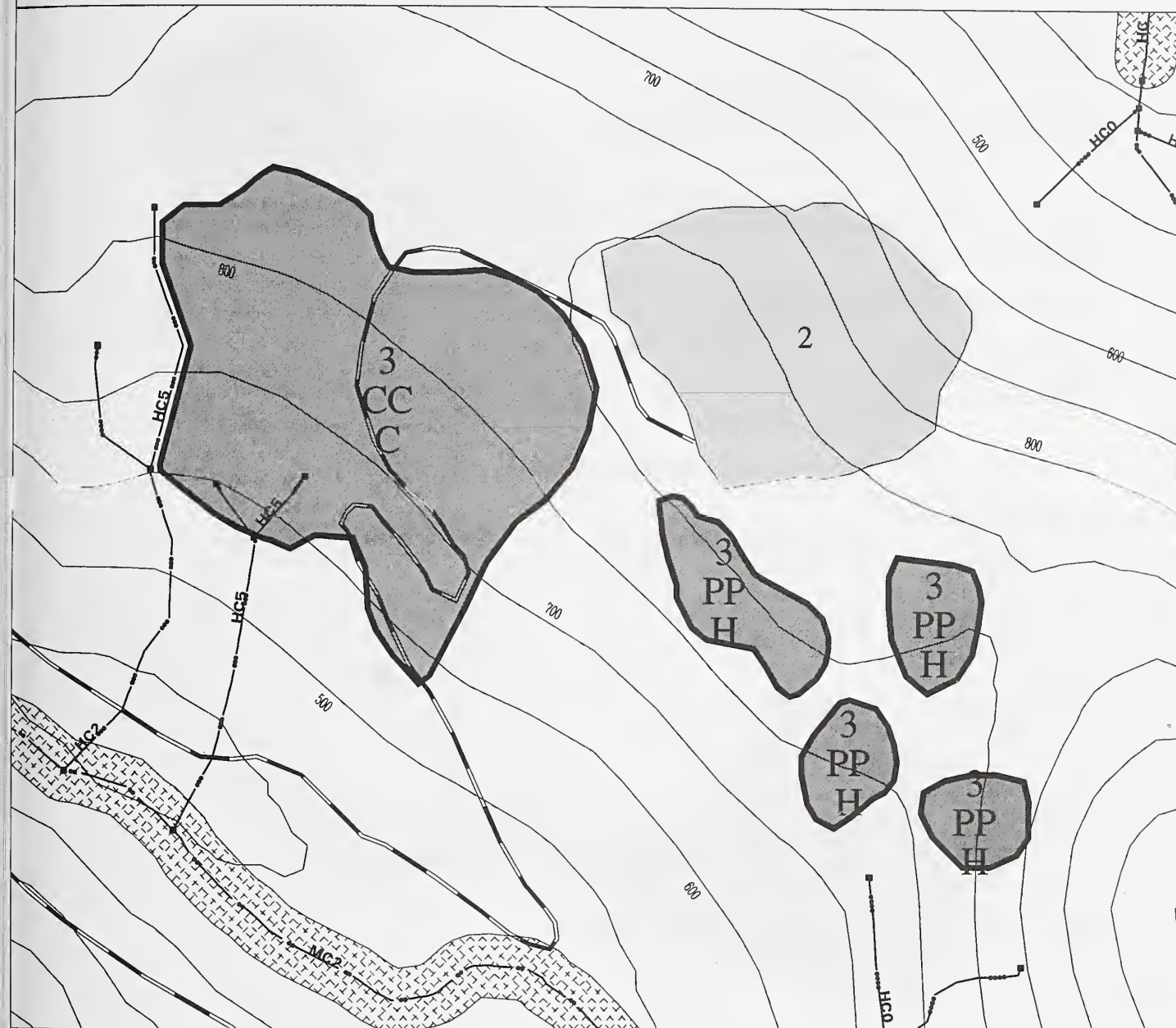
### Special Contract Concerns

Ensure protection of stream.

UNIT 3

ALTERNATIVE 1

40 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 3

In Alternatives 2 & 3

Harvest method Cable and Helicopter

Total Acres 16-19

Total Unit Volume 48 MBF

## UNIT DEVELOPMENT

Unit designed to yard most trees with cable; and helicopter yarding of southeast portion isolated by stream. Unit stays off oversteepened soils. Unit is split by stream. Backline is feathered into remaining timber.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Unit with 10% retention in cable portion and 5% retention in the helicopter portion. |
| Silvicultural Prescription   | Clearcut with retention and Diameter limits  |
| Regeneration Method          | Natural  |
| Possible future treatments:  | Release, possible planting, pre-commercial thinning and pruning.                     |

## Resource CONCERNS & MITIGATION

### Water Quality Fisheries

|            |                                 |
|------------|---------------------------------|
| Concern    | Stream along west side of unit. |
| Mitigation | Provide protection for buffer.  |

### Soils

|            |       |
|------------|-------|
| Concern:   | none. |
| Mitigation |       |

### Wildlife

|            |  |
|------------|--|
| Concern    |  |
| Mitigation |  |

### Visuals

|            |   |
|------------|---|
| Concern    | Appearance of unit from Bradfield Canal.  |
| Mitigation | Retention in unit and diameter limit on upper portion of unit should accomplish the visual objective. |

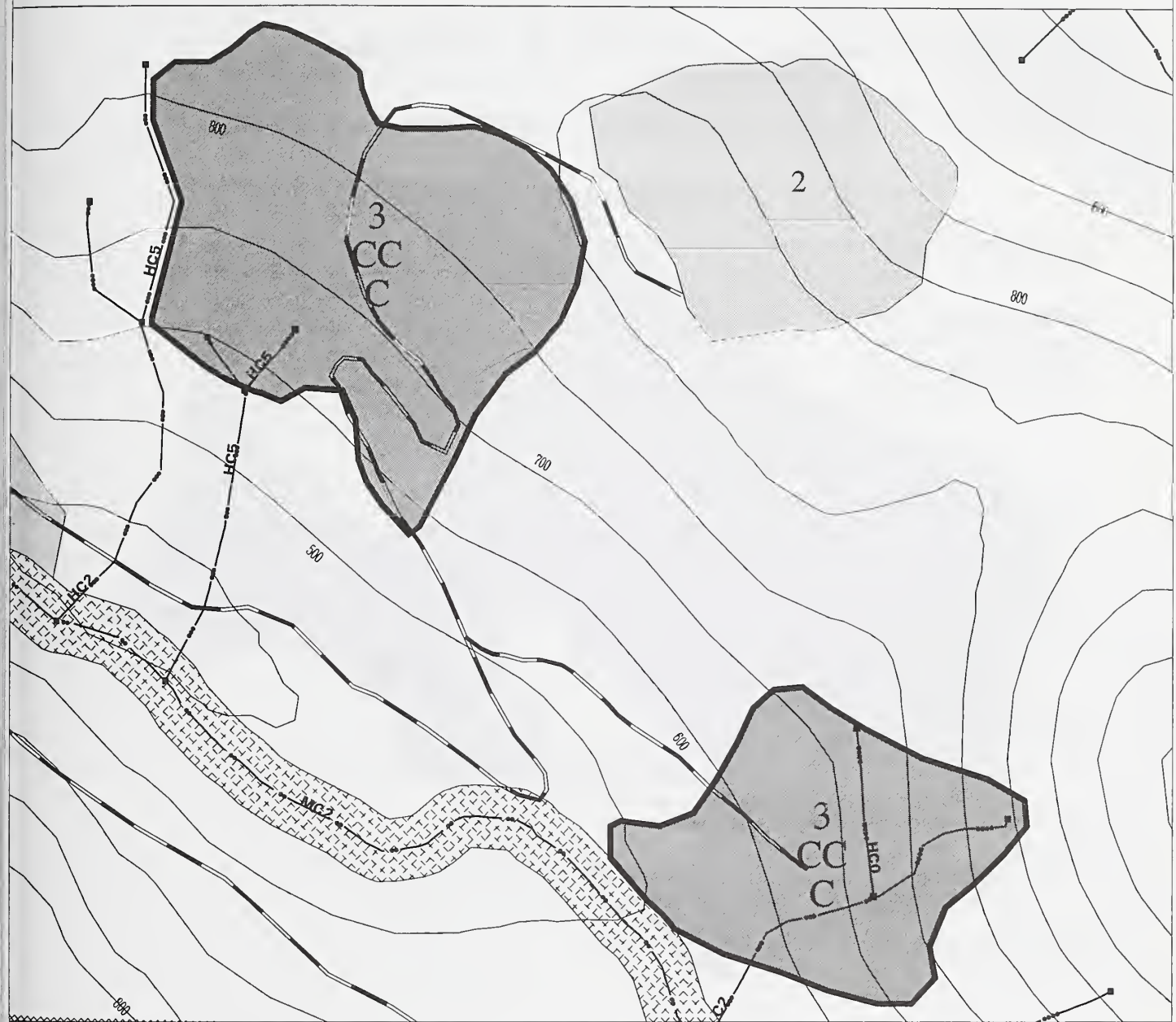
Special Contract Concerns: Ensure protection of stream buffers

# A -Unit Cards and Extra Alternative Maps

UNIT 3

ALTERNATIVE 2 & 3

48 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

## CANAL HOYA Timber Sale

Unit Number 3

In Alternative 4

Harvest method Helicopter

Total Acres 98

Volume per Acre 16.7 MBF

Total Unit Volume 1,635 MBF

### UNIT DEVELOPMENT

Unit designed to meet the visual quality object of partial retention. Much of the unit is not visible from Bradfield Canal.

|                              |   |
|------------------------------|---|
| Stand Management Objectives: | Harvest Unit while leaving a mix of species, retaining about 25%. |
| Silvicultural Prescription:  | Diameter limit.   |
| Regeneration Method:         | Natural.  |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning.              |

### RESOURCE CONCERNS & MITIGATION

#### Water Quality/ Fisheries

|             |  |
|-------------|--|
| Concern:    | Class III streams (HC5) tributary to Survey Creek. Class IV streams in unit.                       |
| Mitigation: | No harvest within notch of Class III streams. Helicopter yarding provides streamcourse protection. |

#### Soils

|             |   |
|-------------|---|
| Concern:    | Avoid steep slopes and V-notches.                   |
| Mitigation: | Full suspension accomplished by helicopter yarding. |

#### Wildlife

|             |  |
|-------------|--|
| Concern:    | Size of unit could create dispersal problems.  |
| Mitigation: | 25% retention of existing forest structure. Scatter reserves to maintain structure throughout and allow dispersal. |

#### Visuals

|             |  |
|-------------|--|
| Concern:    | Appearance of Unit from Bradfield Canal. |
| Mitigation: | Leave reserve trees in unit.             |

Special Contract Concerns: None



# A -Unit Cards and Extra Alternative Maps

UNIT 3

ALTERNATIVE 4

98 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

HARVEST SYSTEMS  
C = Cable  
H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 4

In Alternatives 1, 2, 3, 4

Harvest method Helicopter

Total Acres 32 Volume per Acre 23.7 MBF

Total Unit Volume 757 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with a helicopter. Unit modified to buffer Class III stream. Unit meets the visual quality objective of partial retention. East side of unit dropped for forested wetlands. A portion of the unit was expanded to the south to avoid isolating timber. Unit avoids hazardous soils in the east portion of northern half of unit.

Stand Management Objectives: Future stand to have several canopy layers. Trees are being retained to meet the visual quality objective and to provide structure. Retain a mix of about 10% of the trees until next rotation.

Silvicultural Prescription: Diameter Limit. Harvest trees larger than 14-16 inches. Trees left shall be retained until the next rotation.

Regeneration Method: Natural.

Possible future treatments: Release, possible planting and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class III stream is HC6 tributary to Survey Creek.

Mitigation: No harvest within notch.

### Soils

Concern: Avoid steep slopes.

Mitigation: Locate unit to avoid harvest on slopes greater than 72%.

### Wildlife

Concern: Mountain goat winter range.

Mitigation: Reserve trees provide some snow interception. Avoidance of high hazard areas protects existing habitat.

### Visuals

Concern: Unit can be seen from North side of the Bradfield Canal near Miners Creek.

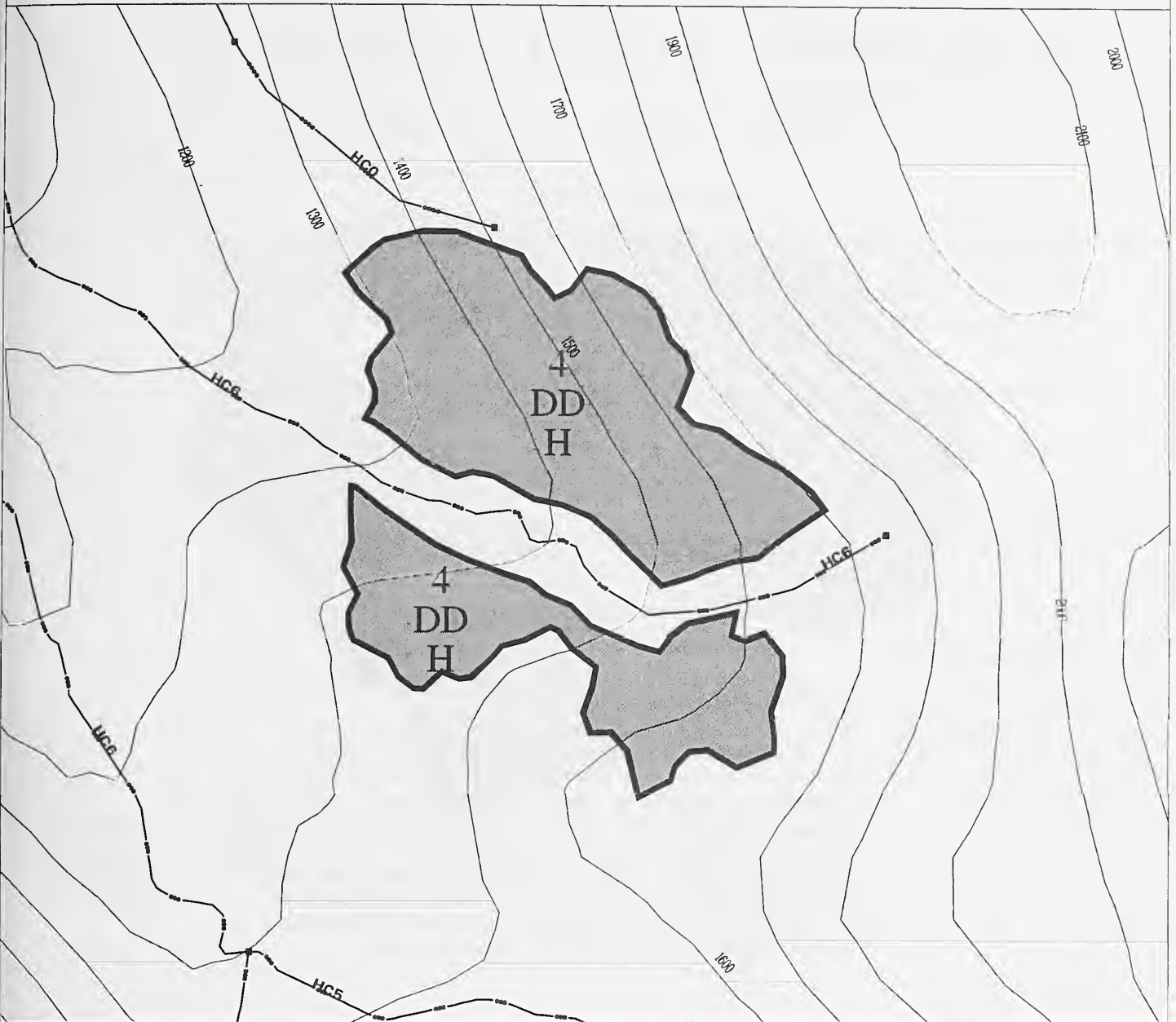
Mitigation: Reserve trees help unit to appear more natural and breakup straight boundaries.

Special Contract Concerns: None

UNIT 4

ALTERNATIVE 1, 2, 3 & 4

32 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

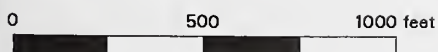
- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

**HARVEST SYSTEMS**

C = Cable  
H = Helicopter



Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

## CANAL HOYA Timber Sale

Unit Number 5

In Alternative 1

Harvest method Helicopter & Cable

Total Acres 63

Volume per Acre 24.5 MBF

Total Unit Volume 1541 MBF

### UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding system on the lower portions of the unit and the upper portion with a helicopter. The unit was shortened on the south side to leave a logical future setting, while maintaining wildlife habitat during this entry. Unit modified to buffer Survey Creek and Class II and III tributaries. Skyline yarding from west side of creek eliminates the need for road construction up east side of creek.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have several canopy layers and at least two age classes. Trees are being retained to provide structure.<br>Retain trees until next rotation. |
| Silvicultural Prescription:  | Clearcut with retention. Helicopter yarding and diameter limit will be used in this unit because of terrain. Retain 10% in Alternative 1.                    |
| Regeneration Method:         | Natural.   |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning and pruning.   |

### RESOURCE CONCERNS & MITIGATION

#### Water Quality Fisheries

|             |  |
|-------------|--|
| Concern:    | Survey Creek (Class II HC and MC process groups) flows through unit. Class IV streams in eastern half of unit.   |
| Mitigation: | No timber harvest within notch of Class II streams. This includes no harvest within 100 feet horizontal distance of Class II streams.<br>No harvest within notch of Class III streams. Unit design will provide Class III stream buffers and Class IV stream protection. Yarding corridors across Survey Creek will be designated by fisheries specialist. Logs shall be suspended over riparian buffer where feasible. Trees felled for yarding corridors within TTRA buffer will be felled away from stream and left in place. Logs shall be fully suspended over stream. A streamcourse protection plan will be developed by the timber sale administrator to enforce mitigation during felling and yarding operations. |

#### Soils

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

#### Wildlife

|             |  |
|-------------|--|
| Concern:    | Easier access for goat hunters may increase harvest and affect population. Goat, deer, forest birds, and marten habitat value. |
| Mitigation: | Close road to motorized access. Retain structure in reserves, buffers, and leave trees.  |

#### Visuals

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

#### Special Contract Concerns

UNIT 5

ALTERNATIVE 1

63 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

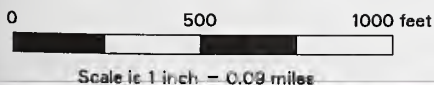
- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

HARVEST SYSTEMS  
 C = Cable  
 H = Helicopter



Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale Unit Number 5 In Alternatives 2 & 3

Harvest method Helicopter & Cable

Total Acres 96

Volume per Acre 24.5 MBF

Total Unit Volume 2349 MBF

## UNIT DEVELOPMENT

In Alternatives 2 & 3 unit designed to harvest trees with cable yarding system on the lower portions of the unit and the upper portion with a helicopter. Yarding corridors will provide cable access to the unit on the east side of Survey Creek. No stable site for either temporary or permanent road could be found to access east side of upper Survey Creek. Terrain is suitable for skyline yarding and eliminates the need for road construction.

Stand Management Objectives: Future stand to have several canopy layers and at least two age classes. Trees are being retained to provide structure.  
Retain trees until next rotation.

Silvicultural Prescription: Clearcut with retention. Helicopter yarding and diameter limit will be Used in this unit because of terrain. Retain 20%

Regeneration Method: Natural.

Possible future treatments: Release, possible planting, pre-commercial thinning and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Survey Creek (Class II HC and MC process group) flows through the unit. Class II tributaries (HC and AF) flow through the east units. Class III and IV streams also flow through unit.

Mitigation: No timber harvest within notch of Class II streams. This includes no harvest within 100 feet horizontal distance of Class II streams. No harvest within 140 feet of outermost AF channel. This includes no harvest within 100 feet horizontal distance of Class II streams. No harvest within notch of Class III streams. Unit design will provide Class III stream buffers and Class IV stream protection. Yarding corridors across Survey Creek will be designated by fisheries specialist. Logs shall be suspended over riparian buffer where feasible. Trees felled for yarding corridors within TTRA buffer will be felled away from stream and left in place. Logs shall be fully suspended over stream. A streamcourse protection plan will be developed by the timber sale administrator to enforce mitigation during felling and yarding operations.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Easier access for goat hunters may increase harvest and affect population. Goat, deer, forest birds, and marten habitat value.

Mitigation: Close road to motorized access. Retain structure in reserves, buffers, and leave trees.

### Visuals

Concern: none

Mitigation:

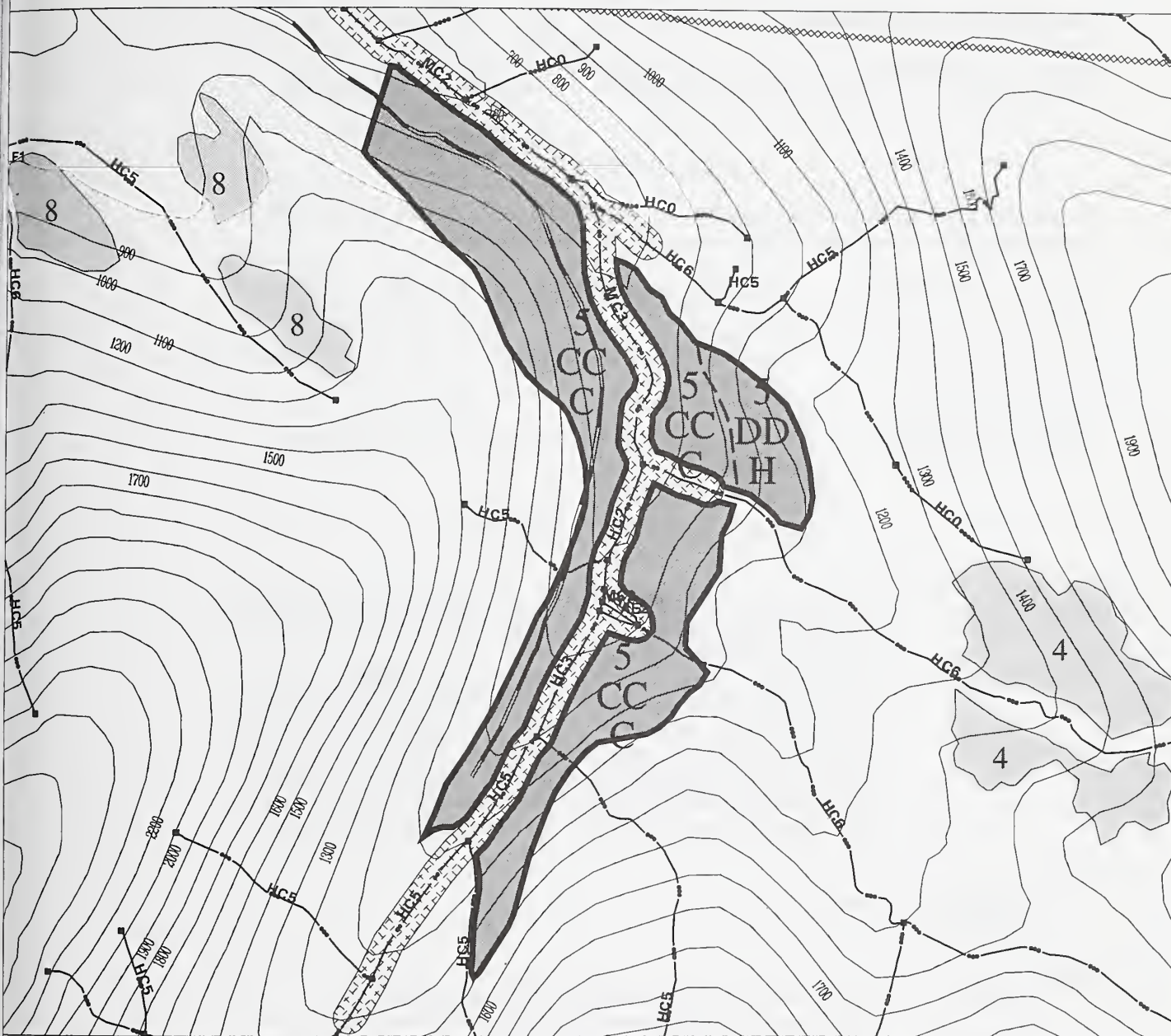
Special Contract Concerns: Suspension over stream during yarding.



UNIT 5

ALTERNATIVE 2 & 3

96 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 1000 2000 feet

Scale is 1 inch = 0.18 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 5

In Alternative 4

Harvest method Helicopter

Total Acres 96

Volume per Acre 24.5 MBF

Total Unit Volume 2349 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with a helicopter yarding system. Unit designed to provide buffers for Survey Creek and its Class II and Class III tributaries flowing through unit.

Stand Management Objectives: Future stand to have several canopy layers and at least two age classes. Trees are being retained to provide structure.  
Retain trees until next rotation.

Silvicultural Prescription: Clearcut with retention. Helicopter yarding and diameter limit will be used. Retain 20%.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Survey Creek (Class II HC and MC process group) flows through the unit. Class II tributaries (HC and AF) flow through the east units. Class III and IV streams also flow through unit.

Mitigation: No timber harvest within notch of Class II streams. This includes no harvest within 100 feet horizontal distance of Class II streams. No harvest within 140 feet of outermost AF channel. This includes no harvest within 100 feet horizontal distance of Class II streams. No harvest within notch of Class III streams. Unit design will provide Class III stream buffers and Class IV stream protection. Helicopter yarding will not require corridors across Survey Creek. Logs will be suspended over all riparian buffers.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Easier access for goat hunters may increase harvest and affect population. Goat, deer, forest birds, and marten habitat value.

Mitigation: Close road to motorized access. Retain structure in reserves, buffers, and leave trees.

### Visuals

Concern: none

Mitigation:

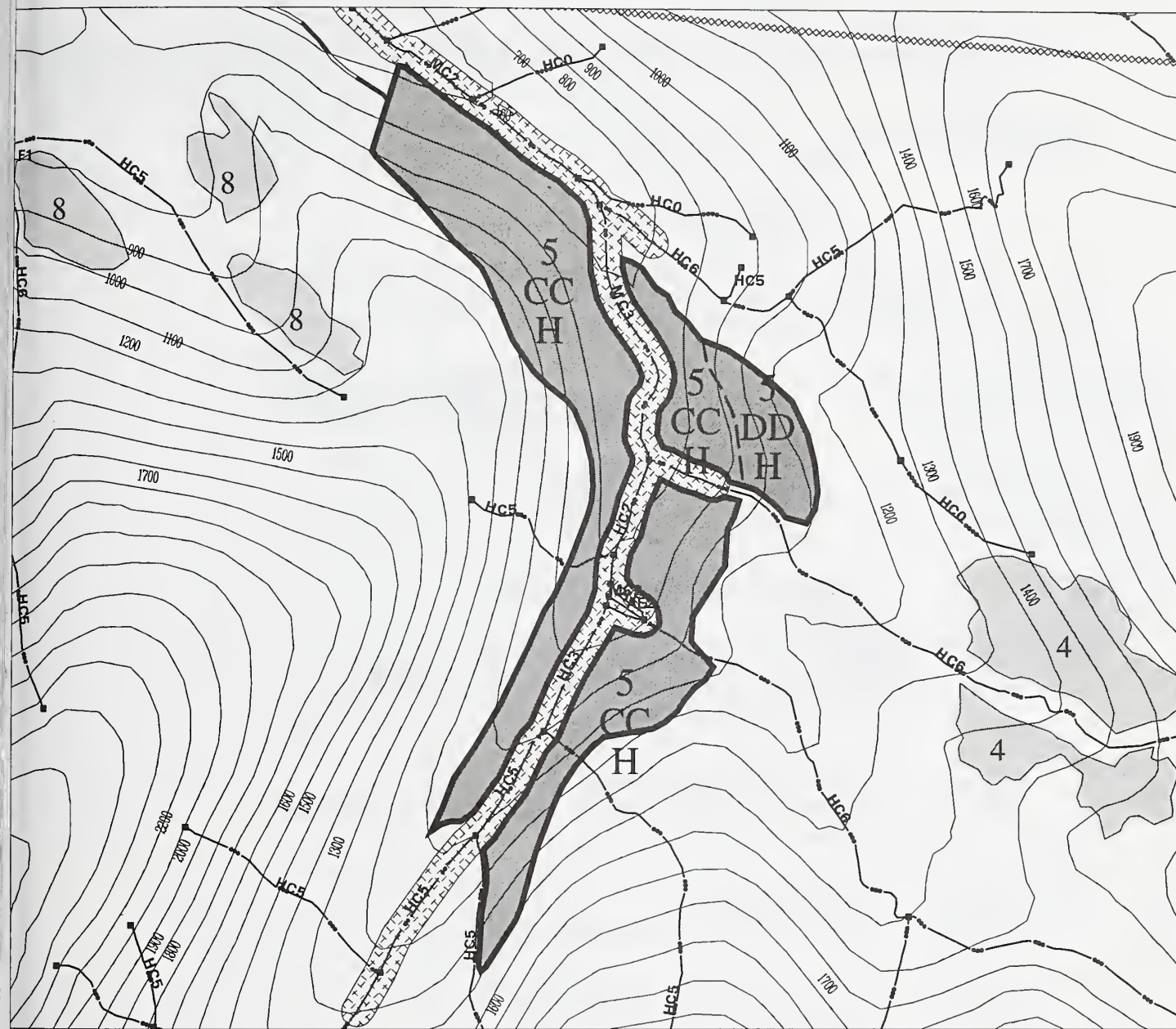
### Special Contract Concerns

Suspension over stream during yarding.

UNIT 5

ALTERNATIVE 4

96 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 1000 2000 feet  
 Scale is 1 inch = 0.18 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale** Unit Number 8.1, 8.2, 8.3, 8.4, 8.5 Alternative 1, 2, 3, 4

Harvest method Helicopter

Total Acres 32

Volume per Acre 22.5 MBF

Total Unit Volume 719 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with a helicopter. This unit is made up of several small patches ranging in size from 2-7 acres. All units avoid harvest on over steepened slopes and have been designed to buffer Class III streams. Unit 8.1 not visible from saltwater. These units are located on a bench.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Only several small patches will be harvested. Portions of area not harvested will provide stand structure and travel corridors for wildlife. |
| Silvicultural Prescription:  | Patch cut harvest all trees larger than 9 inches at d.b.h.   |
| Regeneration Method:         | Natural  |
| Possible Future Treatments:  | Release, possible planting, and pre-commercial thinning.   |

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

|             |   |
|-------------|---|
| Concern:    | Class III streams (HC and AF) tributary to Survey Creek.  |
| Mitigation: | No harvest within notch of Class III streams. No harvest within 140 feet of outermost AF channel. |

### Soils

|             |   |
|-------------|---|
| Concern:    | Harvest on oversteepened slopes.  |
| Mitigation: | Units located to avoid steep slopes. Full suspension with helicopter yarding. |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Wildlife dispersal.                              |
| Mitigation: | Patches provide for travel through uncut timber. |

### Visuals

|             |   |
|-------------|---|
| Concern:    | Appearance of Unit from Bradfield Canal   |
| Mitigation: | Small size and scattered location of patches help unit not dominate the hillside. |

### Special Contract Concerns

Ensure protection of needed buffers.

UNIT 8

ALTERNATIVE 1, 2, 3 & 4

32 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 1000 2000 feet

Scale is 1 inch = 0.18 miles

★ Eagle Nest Tree

Proposed cut units

Adjacent proposed units

TTRA Buffers

1/4 Mile Eagle Nest Timing Buffers

## PRESCRIPTIONS

CC = Clearcut

DD = Diameter Limits

PP = Patch Cut

## HARVEST SYSTEMS

C = Cable

H = Helicopter

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 9

In Alternative 1

Harvest method Cable

Total Acres 41

Volume per Acre 22.1 MBF

Total Unit Volume 907 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding. Unit stays off oversteepened soils and is split by buffered stream. Northwest and southwest unit boundary along Survey Creek and tributaries. At least 10% of the trees will be reserved.

Stand Management Objectives: Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. At least 10% retention.

Silvicultural Prescription: Clearcut with reserves.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Unit borders Survey Creek (Class II FP and MC) and tributary (Class II HC). Class III stream in unit.

Mitigation: No timber harvest in Survey Creek floodplain. No timber harvest within 130 feet of Survey Creek FP channel (includes no harvest within 100 horizontal feet of stream). No harvest within notch of MC and HC streams. Includes no harvest within 100 horizontal feet of Class II streams. Fisheries specialist will assist with buffer layout.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Riparian habitat values for marten and bear along creeks.

Mitigation: Locate reserves adjacent to creeks. Avoid removing possible denning trees and include in reserves whenever possible.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in harvested area and avoid straight backline and sideline.

### Special Contract Concerns

Ensure stream buffer protection.



# A -Unit Cards and Extra Alternative Maps

UNIT 9

ALTERNATIVE 1

41 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 9

In Alternatives 2 & 3

Harvest method Cable

Total Acres 49

Volume per Acre 22.1 MBF Total Unit Volume 907 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding. Unit stays off oversteepened soils and is split by buffered stream. Southwest unit boundary along stream buffer. Road through unit provides access to other units.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 30% retention.

Silvicultural Prescription: Clearcut with reserves

Regeneration Method: Natural

Possible Future Treatments: Possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Unit borders Survey Creek (Class II FP and MC) and tributary (Class II HC). Class III stream in unit.

Mitigation: No timber harvest in Survey Creek floodplain. No timber harvest within 130 feet of Survey Creek FP channel (includes no harvest within 100 horizontal feet of stream). No harvest within notch of MC and HC streams. Includes no harvest within 100 horizontal feet of Class II streams. Fisheries specialist will assist with buffer layout.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: none

Mitigation:

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in harvested area and avoid straight back and side line.

### Special Contract Concerns

Ensure stream buffer protection.

# A -Unit Cards and Extra Alternative Maps

UNIT 9

ALTERNATIVE 2 & 3

49 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

★ Eagle Nest Tree

Proposed cut units

Adjacent proposed units

TTRA Buffers

1/4 Mile Eagle Nest Timing Buffers

## PRESCRIPTIONS

CC = Clearcut

DD = Diameter Limits

PP = Patch Cut

## HARVEST SYSTEMS

C = Cable

H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.08 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 9

In Alternative 4

Harvest method Cable

Total Acres 20

Volume per Acre 17.5 MBF

Total Unit Volume 349 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding. Unit stays off oversteepened soils and is split by buffered stream. Portion of northwest corner of unit adjacent to buffered stream. Road through unit provides access to other units.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 30% retention.

Silvicultural Prescription: Clearcut with reserves. Reserve trees will be retained until next rotation.

Regeneration Method: Natural

Possible Future Treatments: Possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Unit borders Survey Creek (Class II FP and MC) and tributary (Class II HC). Class III stream in unit.

Mitigation: No timber harvest in Survey Creek floodplain. No timber harvest within 130 feet of Survey Creek FP channel (includes no harvest within 100 horizontal feet of stream). No harvest within notch of MC and HC streams. Includes no harvest within 100 horizontal feet of Class II streams. Fisheries specialist will assist with buffer layout.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Riparian habitat for bear and marten.

Mitigation: Unit is smaller and was designed to be further away from creeks than in the other alternatives.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in harvested area and avoid straight back and side line.

### Special Contract Concerns

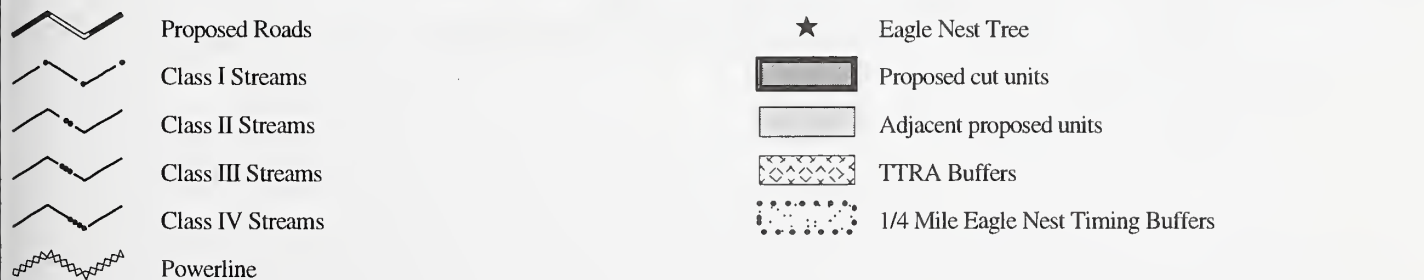
Ensure stream buffer protection.

# A -Unit Cards and Extra Alternative Maps

UNIT 9

ALTERNATIVE 4

20 ACRES



**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

HARVEST SYSTEMS  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

## A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 10      In Alternatives 1, 2, 3 & 4

Harvest method Cable

Total Acres 38

Volume per Acre 24.0 MBF

Total Unit Volume 911 MBF

### UNIT DEVELOPMENT

Unit designed to harvest trees with cable yarding. Unit stays off oversteepened soils and avoids stream buffers.

Stand Management Objectives:      Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention in Alternatives 1-3 and 20% retention in Alternative 4.

Silvicultural Prescription:      Clearcut with reserves. Reserve trees will be retained until the next rotation.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, possible planting, pre-commercial thinning, and pruning.

### RESOURCE CONCERNS & MITIGATION

#### Water Quality Fisheries

Concern:      East and West Forks of Survey Creek (Class II MC and HC) flow some distance on either side of unit.

Mitigation:      No harvest within notch of Class II streams. Fisheries specialist will assist with layout.

#### Soils

Concern:      none

Mitigation:

#### Wildlife

Concern:      Bear denning and foraging habitat.

Mitigation:      Avoid harvest of large trees with cavities, retain 15' of the butt log attached to rootwads and retain snags and downed logs.  
Leave 3-4 reserves that total 3.8 acres.

#### Visuals

Concern:      Appearance of unit from Bradfield Canal.

Mitigation:      Leave trees in harvested area and avoid straight backline.

#### Special Contract Concerns

None



# A -Unit Cards and Extra Alternative Maps

UNIT 10

ALTERNATIVE 1, 2, 3 & 4

38 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 500 1000 feet

Scale is 1 inch = 0.09 miles

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

PRESCRIPTIONS  
CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

HARVEST SYSTEMS  
C = Cable  
H = Helicopter

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**      Unit Number 12      In Alternatives 1, 3 & 4

Harvest method Helicopter

Total Acres 6

Volume per Acre 29.0 MBF

Total Unit Volume 174 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with helicopter yarding. Unit stays off oversteepened soils. There are a few small rock outcrops within the unit. Unit is on the top of a knob. Evidence of past windthrow. Portions of the unit will be seen.

Stand Management Objectives:      Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention in Alternatives 1 & 3. 30% retention in Alternative 4.

Silvicultural Prescription:      Diameter Limit. Reserve trees will be retained until the next rotation.

Regeneration Method:      Natural.

Possible Future Treatments:      Possible planting and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern:      none

Mitigation:

### Soils

Concern      none

Mitigation:

### Wildlife

Concern:      Bear denning.

Mitigation:      Avoid harvest of large trees with cavities; retain snags and downed logs; and retain 15' of butt logs attached to rootwads.

### Visuals

Concern:      Appearance of unit from Bradfield Canal.

Mitigation:      Leave trees in harvested area and avoid straight back and side lines.

### Special Contract Concerns

None.

UNIT 12

ALTERNATIVE 1, 3 & 4

6 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 500 1000 feet

Scale is 1 inch = 0.09 miles

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 13

In Alternatives 1 & 3

Harvest method Helicopter

Total Acres 18

Volume per Acre 17.9 MBF

Total Unit Volume 323 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with helicopter yarding. Unit stays off oversteepened soils and avoids stream buffers. There are small rock outcrops within the unit with small trees. Ninety to ninety-five percent of the unit is not seen. Unit screened by beach buffers, but higher knobs in west portion of unit may be seen.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention. |
| Silvicultural Prescription:  | Diameter Limit. Retention will be retained until next rotation.  |
| Regeneration Method:         | Natural  |
| Possible Future Treatments:  | Release, possible planting, and pre-commercial thinning  |

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

|             |   |
|-------------|---|
| Concern:    | Southern boundary runs along a Class IV stream that originates in a muskeg. |
| Mitigation: | Unit excludes stream.   |

### Soils

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Bear denning.  |
| Mitigation: | Avoid harvest of large trees with cavities; retain snags and downed logs. On downed logs leave at least 15' of the butt log attached to rootwad. |

### Visuals

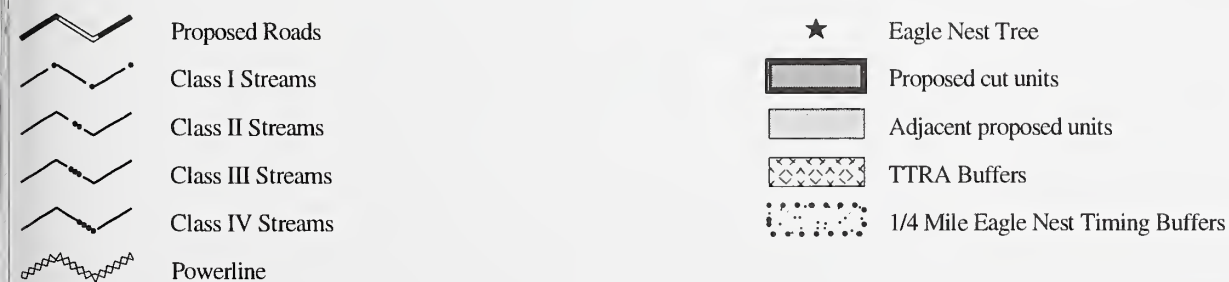
|             |  |
|-------------|--|
| Concern:    | Appearance of unit from Bradfield Canal.                   |
| Mitigation: | Leave trees in harvested area and avoid straight backline. |

### Special Contract Concerns

UNIT 13

ALTERNATIVE 1 & 3

18 ACRES



**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 13

In Alternative 4

Harvest method Helicopter

Total Acres 63 Volume per Acre 18.0 MBF Total Unit Volume 1,132 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Unit stays out of beach buffer.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. Leave a mix of species, retaining about 30%.  
Silvicultural Prescription: Diameter limit. Retention will be retained until next rotation.  
Regeneration Method: Natural  
Possible Future Treatments: Release, possible planting, and pre-commercial thinning

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class IV stream tributary to Survey Creek west of unit.  
Mitigation: Unit excludes stream.

### Soils

Concern: Avoid steep slopes > 72% and V-notches. Forested wetlands in central southern part of the unit.  
Mitigation: Minimize ground disturbance

### Wildlife

Concern: Deer winter range value.  
Mitigation: Retention of trees within unit will enhance snow interception in the future stand.

### Visuals

Concern: Appearance of Unit from Bradfield Canal.  
Mitigation: Leave trees in the unit to reduce visual impacts.

### Special Contract Concerns

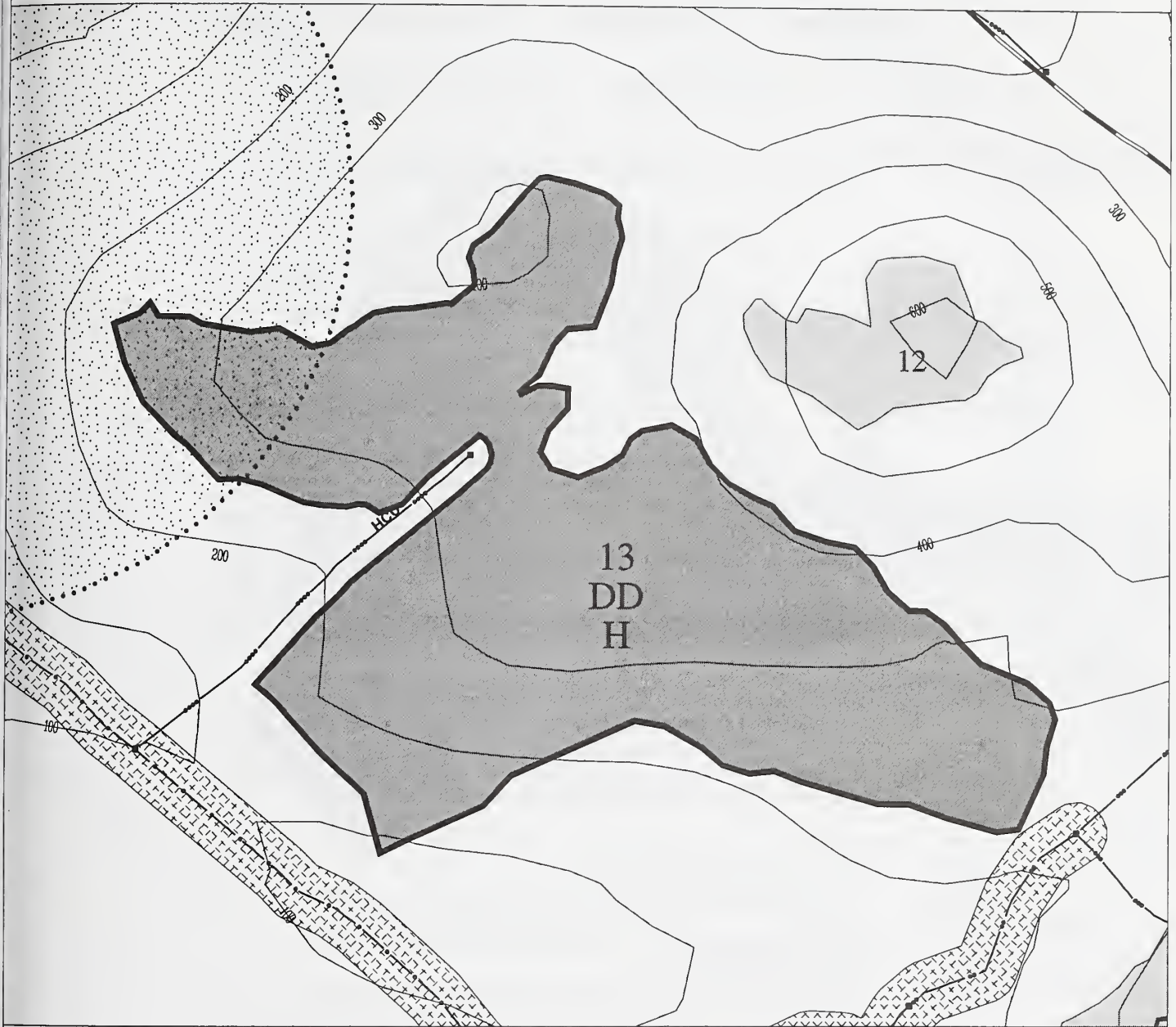
None



UNIT 13

ALTERNATIVE 4

63 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**      Unit Number 14      In Alternatives 1, 2, & 3

Harvest method Cable

Cable Acres 39

Volume per Acre 10.8 MBF

Cable Volume 417 MBF

Harvest method Helicopter

Helicopter Acres 5

Volume per Acre 10.8 MBF

Helicopter Volume 59 MBF

## UNIT DEVELOPMENT

Unit designed to harvest trees with both cable and helicopter yarding. Road through unit provides access to other cable and helicopter units. Unit stays off oversteepened soils and has been modified to buffer Class II streams. Retention of 10% will help unit meet standards and guidelines.

Stand Management Objectives:      Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Clearcut with 10% retention and feather backline.

Regeneration Method:      Natural

Possible Future Treatments:      Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Small Class II streams (HC and MM) tributary to Survey Creek and Surho Creek. Class IV stream in unit.

Mitigation:      No timber harvest within notch on HC stream or within 120 feet of MM stream. This includes no harvest within 100 feet horizontal distance of Class II streams. Partial suspension allowed on Class IV stream.

### Soils

Concern:      Harvest on oversteepened slopes.

Mitigation:      Locate units to avoid harvest on slopes > 72%.

### Wildlife

Concern:      Small mammal dispersal. Loss of large trees for nesting and denning. Fragmentation.

Mitigation:      Place reserves (4-5 acres) within the unit to maintain structural diversity. Place at least one reserve to provide corridor through unit.

### Visuals

Concern:      Appearance of unit from Bradfield Canal.

Mitigation:      Leave trees in harvested area and avoid straight backline.

### Special Contract Concerns

Ensure stream buffer protection.

UNIT 14

ALTERNATIVE 1, 2 & 3

44 ACRES



|   |  |
|---|--|
| Proposed Roads<br>Class I Streams<br>Class II Streams<br>Class III Streams<br>Class IV Streams<br>Powerline | Eagle Nest Tree<br>Proposed cut units<br>Adjacent proposed units<br>TTRA Buffers<br>1/4 Mile Eagle Nest Timing Buffers |
|---|--|

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**

CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**

C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number **18**

In Alternative **1**

Harvest method Cable

Total Acres 13

Volume per Acre 16.1 MBF

Total Unit Volume 209 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Unit north boundary adjacent to high hazard soils. Forested wetland adjacent to the west side of the unit. Unit was reduced from original size due to low volume in surrounding area. Unit will be helicopter yarded with partial harvest with retention.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention. |
| Silvicultural Prescription:  | Cable portion will have reserves. Retention will be retained until next rotation in both alternatives.   |
| Regeneration Method:         | Natural  |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning, and pruning.  |

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

### Soils

|             |       |
|-------------|-------|
| Concern:    | none. |
| Mitigation: |       |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Proximity to estuary and streams important for bear foraging.<br>Road intercepts travel corridor for bears |
| Mitigation: | Small unit, gate roads, leave 1-2 reserves (1.3-2.6 acres).  |

### Visuals

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

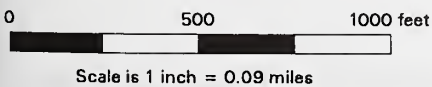
UNIT 18

ALTERNATIVE 1

13 ACRES



- |   |  |
|---|--|
| Proposed Roads<br>Class I Streams<br>Class II Streams<br>Class III Streams<br>Class IV Streams<br>Powerline | Eagle Nest Tree<br>Proposed cut units<br>Adjacent proposed units<br>TTRA Buffers<br>1/4 Mile Eagle Nest Timing Buffers |
|---|--|
- 
- |  |   |   |
|--|---|---|
| <b>E</b> Proposed LTF Sites<br><br>HC1,MM3,... Channel Types | <b>PRESCRIPTIONS</b><br>CC = Clearcut<br>DD = Diameter Limits<br>PP = Patch Cut | <b>HARVEST SYSTEMS</b><br>C = Cable<br>H = Helicopter |
|--|---|---|



Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number **18**

In Alternative **4**

Harvest method Helicopter

Total Acres 13

Volume per Acre 16.1 MBF

Total Unit Volume 209 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Unit north boundary adjacent to high hazard soils. Forested wetland adjacent to the west side of the unit. Unit was reduced from original size due to low volume in surrounding area.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 20% retention. |
| Silvicultural Prescription:  | Cable portion will have reserves. Retention will be retained until next rotation in both alternatives.   |
| Regeneration Method:         | Natural  |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning, and pruning.  |

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

### Soils

|             |       |
|-------------|-------|
| Concern:    | none. |
| Mitigation: |       |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Proximity to estuary and streams important for bear foraging.<br>Road intercepts travel corridor for bears |
| Mitigation: | Small unit, gate roads, leave 1-2 reserves (1.3-2.6 acres).  |

### Visuals

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |



# A -Unit Cards and Extra Alternative Maps

UNIT 18

ALTERNATIVE 4

13 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**      Unit Number 19      In Alternatives 1, 2 & 3

Harvest method Cable

Total Acres 25

Volume per Acre 20.0 MBF

Total Unit Volume 500 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. East boundary is not straight. Unit goes under the Tyee power line. Spur road is located just above small muskeg included in the unit.

Stand Management Objectives:      Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Cable portion will have reserves. Feather backlines. Retention will be left until next rotation.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Hoya Creek (Class II MC) flows west of unit. Class IV stream in unit.

Mitigation:      No harvest within notch of Hoya Creek. Includes no harvest within 100 feet horizontal distance of Hoya Creek. Partial suspension allowed across Class IV stream.

### Soils

Concern:      Steep slopes to east and south of unit.

Mitigation:      Unit shaped to avoid the steep slopes.

### Wildlife

Concern:      Improved access for goat hunters may increase harvest and impact population. Loss of structural diversity.

Mitigation:      Close roads after logging with gates and closure order. Place 1-2 reserves (2.5 acres total) within the unit.

### Visuals

Concern:      Appearance of Unit from Bradfield Canal.

Mitigation:      Leaving trees in unit with 10% retention will help meet the visual quality objective. Irregular boundary along east side.

UNIT 19

ALTERNATIVE 1, 2 & 3

25 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

HARVEST SYSTEMS  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 20      In Alternatives 2 & 3

Harvest method Helicopter

Total Acres 10

Volume per Acre 28.5 MBF

Total Unit Volume 285 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Unit modified to provide Class II and Class III stream buffers. Unit is located at the toe of a very steep mountain slope.

Stand Management Objectives:      Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Helicopter with upper and lower diameter limit.

Regeneration Method:      Natural.

Possible Future Treatments:      Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern:      Hoya Creek (Class II) flows west of unit. Channel Type is MC2. A short Class II tributary divides unit. Class III and IV streams flow through unit.

Mitigation:      No harvest within 100 horizontal feet of Hoya Creek or its Class II tributary (includes no harvest within notch). No harvest within notch of Class III stream. Helicopter yarding provides Class IV stream protection.

### Soils

Concern:      Oversteepened slopes east of unit.

Mitigation:      Locate unit to avoid the slopes > 72%.

### Wildlife

Concern:      Travel corridor and high habitat values for deer, marten, bear, forest birds.

Mitigation:      Structural diversity remains within stream buffers and within the unit.

### Visuals

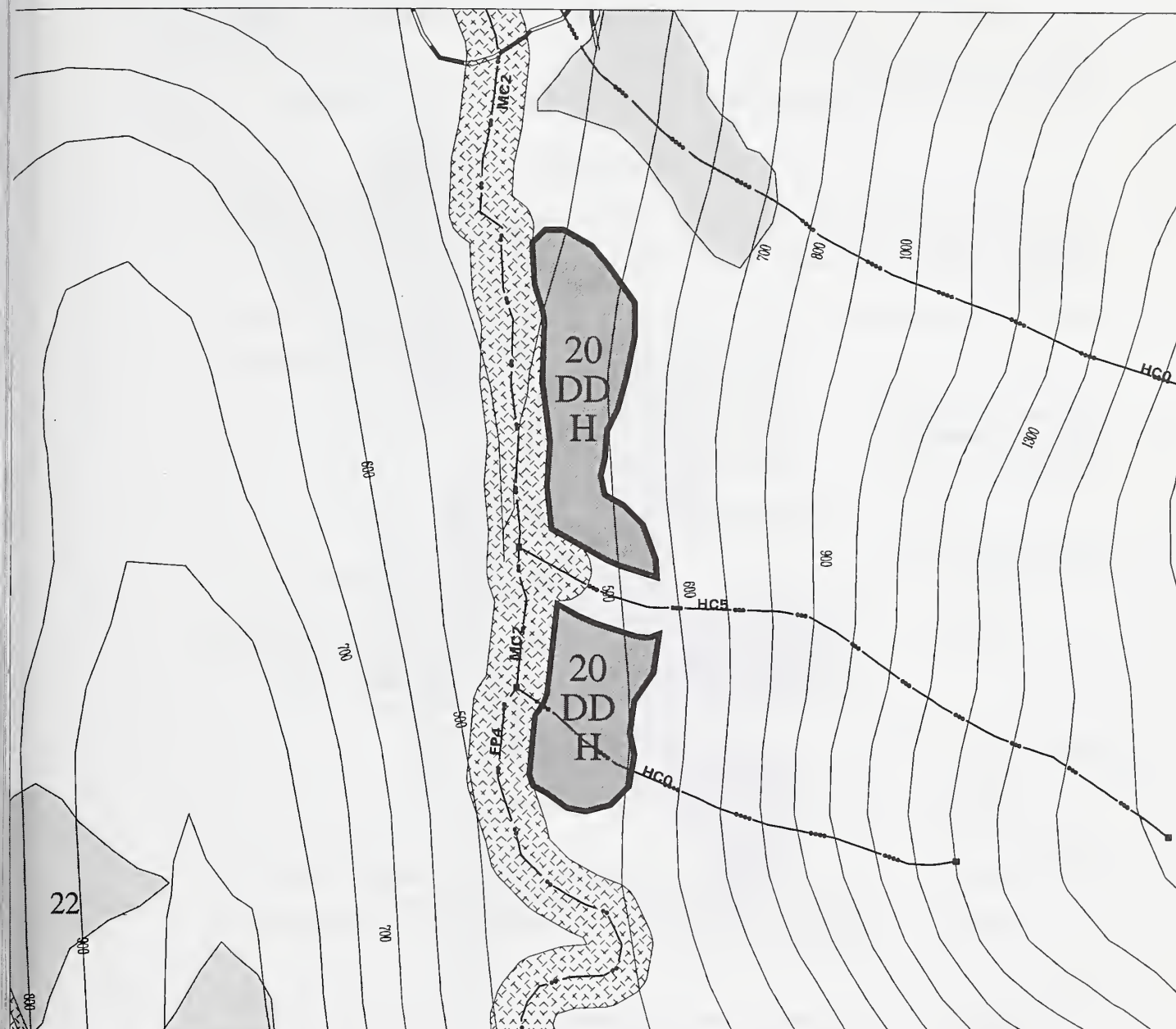
Concern:      Appearance of Unit from Bradfield Canal.

Mitigation:      Leave trees in unit to help meet the visual quality objective.

UNIT 20

ALTERNATIVE 2 & 3

10 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

## CANAL HOYA Timber Sale

Unit Number 21 In Alternatives 1, 2 & 3

Harvest method Helicopter

Total Acres 34

Volume per Acre 36.7 MBF

Total Unit Volume 1,249 MBF

### UNIT DEVELOPMENT

Unit modified to provide Class II and Class III stream buffers. Southern most portion of unit dropped. East portion of unit adjacent to high hazard soils. Possible diameter limit of 18-20" for spruce and 14" for hemlock. Unit has a few short pitches over 72% slope but these are stable.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription: Helicopter with upper and lower diameter limit.

Regeneration Method: Natural.

Possible future treatments: Release and pre-commercial thinning.

### RESOURCE CONCERNS & MITIGATION

#### Water Quality/ Fisheries

Concern: Hoya Creek (Class II FP4) and short Class II (MM1) tributaries west of unit. Class IV streams within unit.

Mitigation: No harvest within floodplain or 130 feet of Hoya Creek (includes no harvest within 100 horizontal feet of stream). No harvest within 120 feet of Class II tributaries (includes no harvest within 100 horizontal feet of streams). Helicopter yarding provides Class IV stream protection.

#### Soils

Concern: Short steep pitches in unit.

Mitigation: Helicopter yarding and resulting full suspension.

#### Wildlife

Concern: Noise from helicopter yarding may disturb goat populations. Travel corridor and riparian habitat values. Deer winter range

Mitigation: Avoid flying over goats with kids. Retain structural diversity within stream buffer and within the unit.

#### Visuals

Concern: Appearance of Unit from Bradfield Canal.

Mitigation: Leaving trees in unit with diameter limit retention will help meet the visual quality objective.

#### Special Contract Concerns

Ensure buffers protected.



UNIT 21

ALTERNATIVE 1, 2 & 3

34 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 22      In Alternatives 1, 2 & 3

Harvest method Helicopter

Total Acres 20

Volume per Acre 22.1 MBF

Total Unit Volume 441 MBF

## UNIT DEVELOPMENT

Unit not visible from saltwater. Unit is three small patches with a Class II stream between 22.1 and 22.3 requiring a buffer. Unit 22.3 contains two Class III streams.

Stand Management Objectives:      Stand will be predominately even aged. Trees smaller than 9" at dbh will be cut only for safety. Future stand will have two age classes, one from the small uncut trees, the other as a result of the regeneration after the harvest. Small even age patches.

Silvicultural Prescription:      Clearcut in small patches.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Class II stream is HC3 tributary to West Fork of Hoya Creek.  
Class III streams are small HC5s.

Mitigation:      No timber harvest within 100 feet horizontal distance from Class II stream.  
No timber harvest within notch of Class II or Class III streams.

### Soils

Concern:      none

Mitigation:

### Wildlife

Concern:      Unit 22.3 adjacent to Old Growth Reserve. Noise from helicopter yarding may disturb goat populations. Goat and deer winter range.

Mitigation:      Avoid flying over goats with kids. Winter range retained in uncut portion.

### Visuals

Concern:      none

Mitigation:

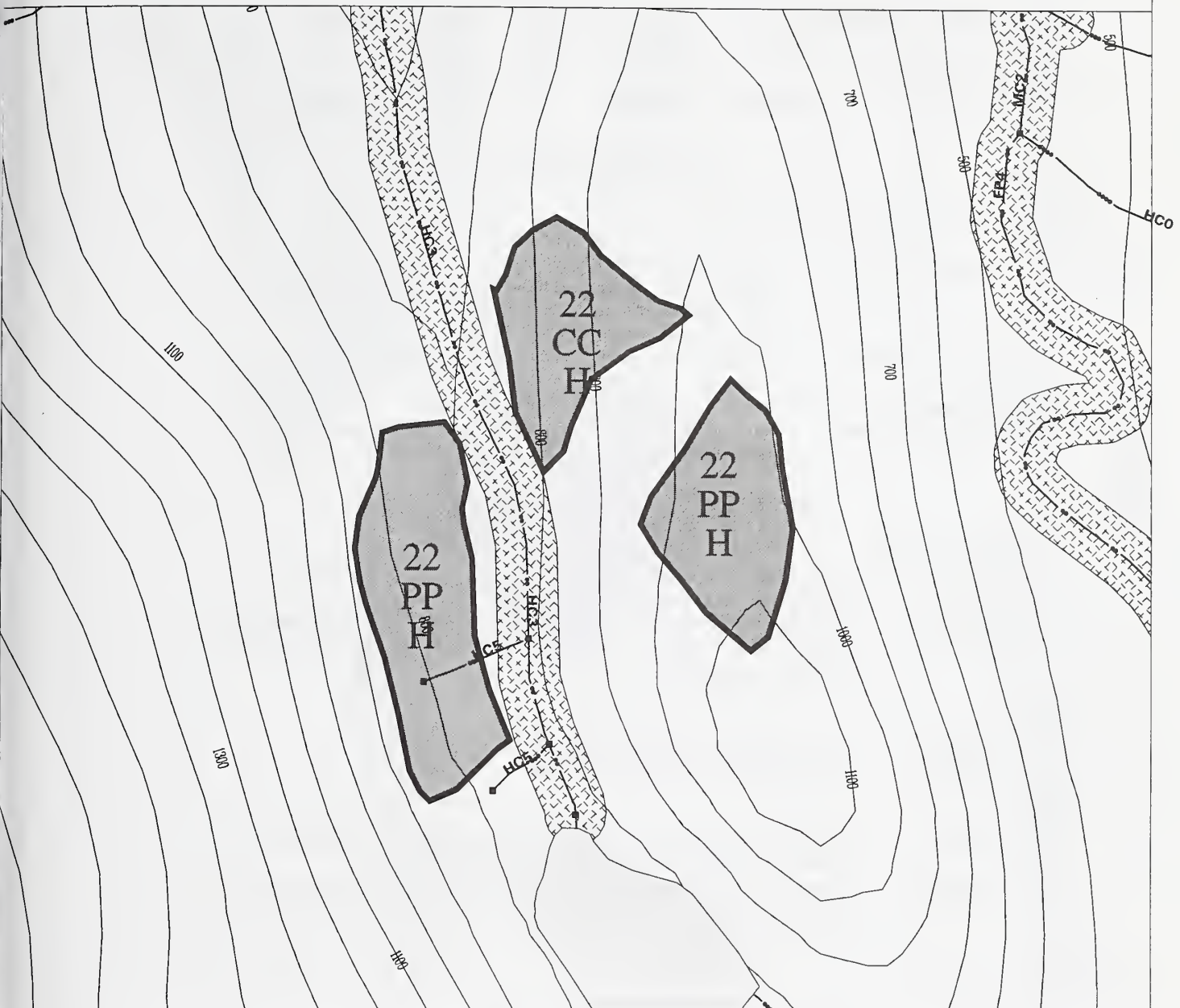
### Special Contract Concerns


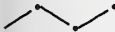




Ensure stream buffers protected.

UNIT 22

ALTERNATIVE 1, 2 & 3

20 ACRES



-  Proposed Roads
-  Class I Streams
-  Class II Streams
-  Class III Streams
-  Class IV Streams
-  Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

★ Eagle Nest Tree

 Proposed cut units

 Adjacent proposed units

 TTRA Buffers

 1/4 Mile Eagle Nest Timing Buffers

## PRESCRIPTIONS

CC = Clearcut

DD = Diameter Limits

PP = Patch Cut

## HARVEST SYSTEMS

C = Cable

H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 23      In Alternative 1

Harvest method Cable

Total Acres 13

Volume per Acre 16.9 MBF

Total Unit Volume 220 MBF

## UNIT DEVELOPMENT

West side boundary adjacent to Class II stream.

Stand Management Objectives:      Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Clearcut with reserves. Retention will be retained until the next rotation.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, possible planting, pre-commercial thinning and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Class II stream is MM1 (West Fork of Hoya Creek). Unit requires temporary road across Class II stream.

Mitigation:      No harvest within 120 feet of Class II stream (including no harvest within 100 horizontal feet of stream). Log stringer bridge will be removed after harvest is complete.

### Soils

Concern:      Steep slopes to southeast side of unit.

Mitigation:      Unit located to avoid the steep slopes.

### Wildlife

Concern:      Improved access for goat hunters may increase harvest and impact populations. Nesting habitat for forest songbirds.

Mitigation:      Close roads after logging with gates and closure order. Retain a reserve of 1.3 acres within the unit connected to backline and include cliffs to allow for goat dispersal.

### Visuals

Concern:      Appearance of Unit from Bradfield Canal.

Mitigation:      Leave trees in unit with 10% retention to help meet the visual quality objective.

### Special Contract Concerns

Ensure stream buffers protected.

UNIT 23

ALTERNATIVE 1

13 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

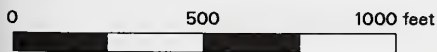
- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter



Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 24

In Alternatives 1, 2 & 3

Harvest method Cable

Cable Acres 51

Volume per Acre 17.0 MBF

Total Cable Volume 869 MBF

Harvest method Helicopter

Helicopter Acres 9

Volume per Acre 17.0 MBF

Total Helicopter Volume 153 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Upper, south portion of unit will be yarded with helicopter and is adjacent to high hazard soils. Unit north boundary is irregular shaped. Unit goes under the Tyee power line. West edge of unit borders on high hazard soils. For the diameter limit consider 16 inches. Unit excludes cliffs between cable and helicopter settings. Unit includes a short steep pitch (75-88%) with shallow well drained soils. Bedrock controls slope angle. Risk of management induced mass wasting or soil erosion is thought to be low. Class II stream south of unit. Class III or IV streams within unit.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention. |
| Silvicultural Prescription:  | Cable portion will have reserves. Helicopter 16' diameter limit.   |
| Regeneration Method:         | Natural.   |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning, and pruning.  |

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

|             |   |
|-------------|---|
| Concern:    | Class II stream is MM1 (West Fork of Hoya Creek). Small Class III or Class IV streams within unit shall be verified during unit layout.   |
| Mitigation: | No harvest within 120 feet of Class II stream (includes no harvest within 100 horizontal feet). No harvest within notch of Class III streams. Split yard Class IV streams. Road location (or helicopter yarding) will provide both Class III and Class IV protection. |

### Soils

|             |   |
|-------------|---|
| Concern:    | Soil disturbance and erosion.   |
| Mitigation: | Unit located to avoid the steep unstable slopes and cliffs and full suspension on steep slopes. |

### Wildlife

|             |   |
|-------------|---|
| Concern:    | Improved access for goat hunters may increase harvest and impact populations.   |
| Mitigation: | Close roads after logging with gates and closure order. Retain 4-5 reserves (6 acres total) connected to backline and include cliffs to allow for goat dispersal. |

### Visuals

|             |   |
|-------------|---|
| Concern:    | Appearance of Unit from Bradfield Canal.  |
| Mitigation: | Leave trees in unit with a diameter limit and the 10% retention to meet the visual quality objective. |



UNIT 24

ALTERNATIVE 1, 2 & 3

60 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 1000 2000 feet

Scale is 1 inch = 0.18 miles

★ Eagle Nest Tree

Proposed cut units

Adjacent proposed units

TTRA Buffers

1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**

CC = Clearcut

DD = Diameter Limits

PP = Patch Cut

**HARVEST SYSTEMS**

C = Cable

H = Helicopter

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 25

In Alternative 4

Harvest method Helicopter

Total Acres 32

Volume per Acre 17.0 MBF

Total Unit Volume 544 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. Unit will be yarded with helicopter and is adjacent to high hazard soils along the west edge. A sharp shinned hawk nest buffer and a muskeg resulted in this unit being dropped from the other alternatives and expanded to the west and south in this alternative. A large portion of the east and north portions of unit dropped because of nest.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 20% retention. |
| Silvicultural Prescription:  | Helicopter yarding with diameter limit.  |
| Regeneration Method:         | Natural.   |
| Possible Future Treatments:  | Release, possible planting, and pre-commercial thinning.   |

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

|             |  |
|-------------|--|
| Concern:    | Northeast boundary approaches Hoya Creek (Class II).   |
| Mitigation: | No harvest within notch of Hoya Creek. This includes no harvest within 100 feet horizontal distance of Hoya Creek. |

### Soils

|             |   |
|-------------|---|
| Concern:    | Steep slopes to west and south of unit. |
| Mitigation: | Unit located to avoid the steep slopes. |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Sharp-shinned hawk nest in unit.           |
| Mitigation: | Nest buffered with 600 foot radius buffer. |

### Visuals

|             |  |
|-------------|--|
| Concern:    | Appearance of unit from Bradfield Canal                  |
| Mitigation: | Leave trees in unit and design an irregular shaped unit. |

# A -Unit Cards and Extra Alternative Maps

UNIT 25

ALTERNATIVE 4

32 ACRES



**E** Proposed LTF Sites

HC1,MM3,... Channel Types

## PRESCRIPTIONS

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

## HARVEST SYSTEMS

C = Cable  
H = Helicopter

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 27      In Alternative 1

Harvest method Cable

Total Acres 18

Volume per Acre 22.7 MBF

Total Unit Volume 409 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objective of partial retention. No harvest in the beach buffer.

Stand Management Objectives:      Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Clearcut with individually marked leave clumps.

Regeneration Method:      Natural.

Possible Future Treatments:      Release, possible planting, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern:      No concerns.

Mitigation:

### Soils

Concern:      Harvest on oversteepened slopes.

Mitigation:      Unit layout will avoid harvest on slopes > 72%.

### Wildlife

Concern:      Travel corridor for bears; denning potential; forest birds.

Mitigation:      Avoid harvest of large trees with cavities, retain snags and downed logs  
Place 2-4 reserves within the unit (4.5 acres total). Avoid removing trees with nests.

### Visuals

Concern:      Appearance of unit from Bradfield Canal

Mitigation:      Leave trees in clumps to help meet the visual quality objective.

Special Contract Concerns:

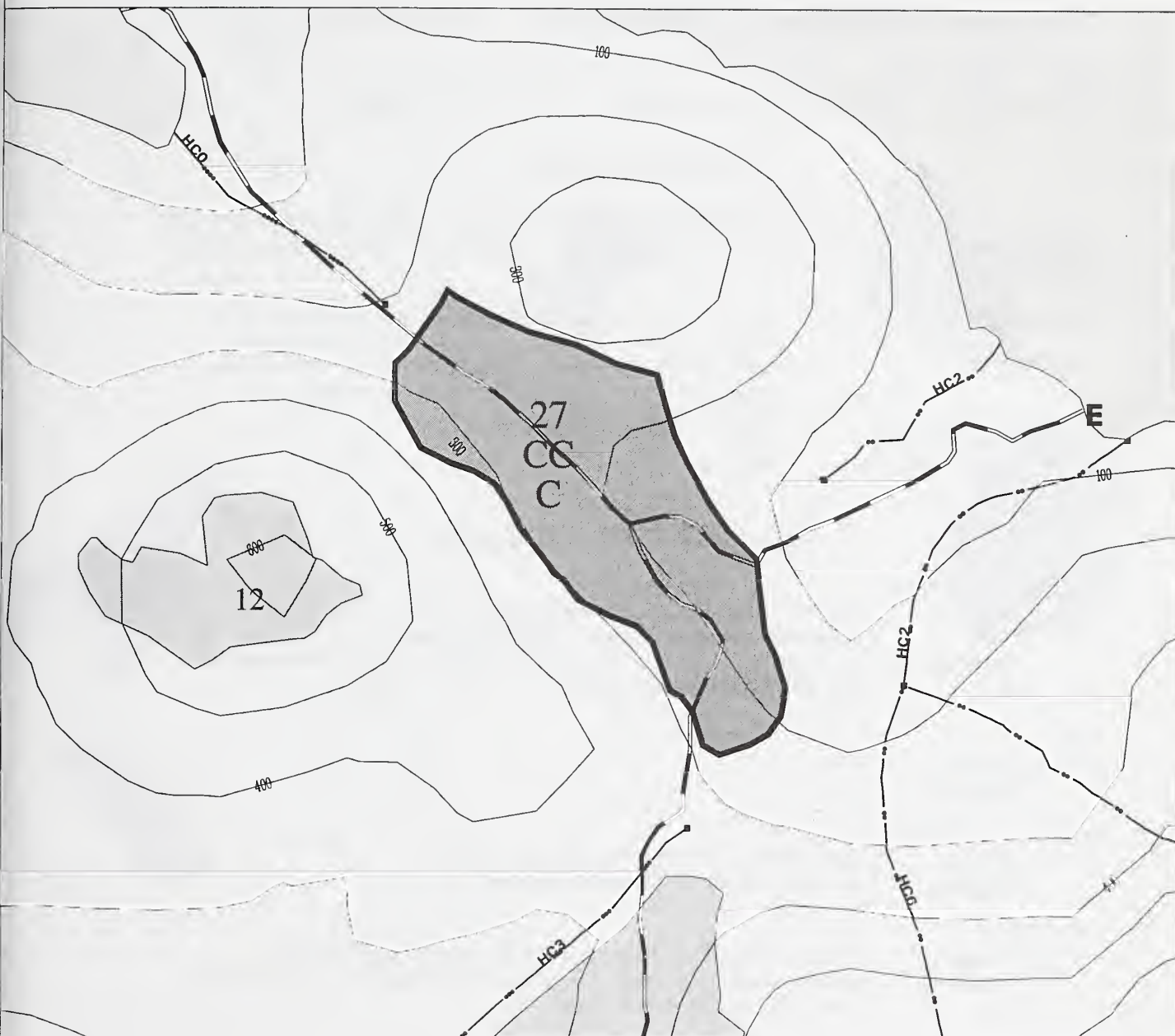
None

# A -Unit Cards and Extra Alternative Maps

UNIT 27

ALTERNATIVE 1

18 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

HARVEST SYSTEMS  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 28

In Alternatives 1, 3 & 4

Harvest method Helicopter

Total Acres 21

Volume per Acre 17.1 MBF

Total Unit Volume 359 MBF

## UNIT DEVELOPMENT

Unit 28.1 is a 7 acre patch with a Class III stream along the west side, requiring a buffer. Units are located in areas surrounded by steep areas. The other 6 units are small patch cuts. Unit will be yarded to a barge using a helicopter.

Stand Management Objectives: Stand will be predominately even aged. Trees smaller than 9" at dbh will be cut only for safety. Future stand will have two age classes, one from the small uncut trees, the other as a result of the regeneration after the harvest. Small even age patches.

Silvicultural Prescription: Clearcut in small patches.

Regeneration Method: Natural.

Possible Future Treatments: Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class III streams adjacent to several patches. None are tributary to freshwater fish habitat. Class IV streams in one patch.

Mitigation: No timber harvest within notch of Class III streams. Helicopter yarding provide Class IV stream protection.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Travel corridor between Canal and Hoya Creeks.

Mitigation: Small unit size allows for wildlife dispersal.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance from Bradfield Canal.

Mitigation: Harvest helicopter will leave the small sub-merchantable trees standing.

### Special Contract Concerns

Ensure stream buffers protected.

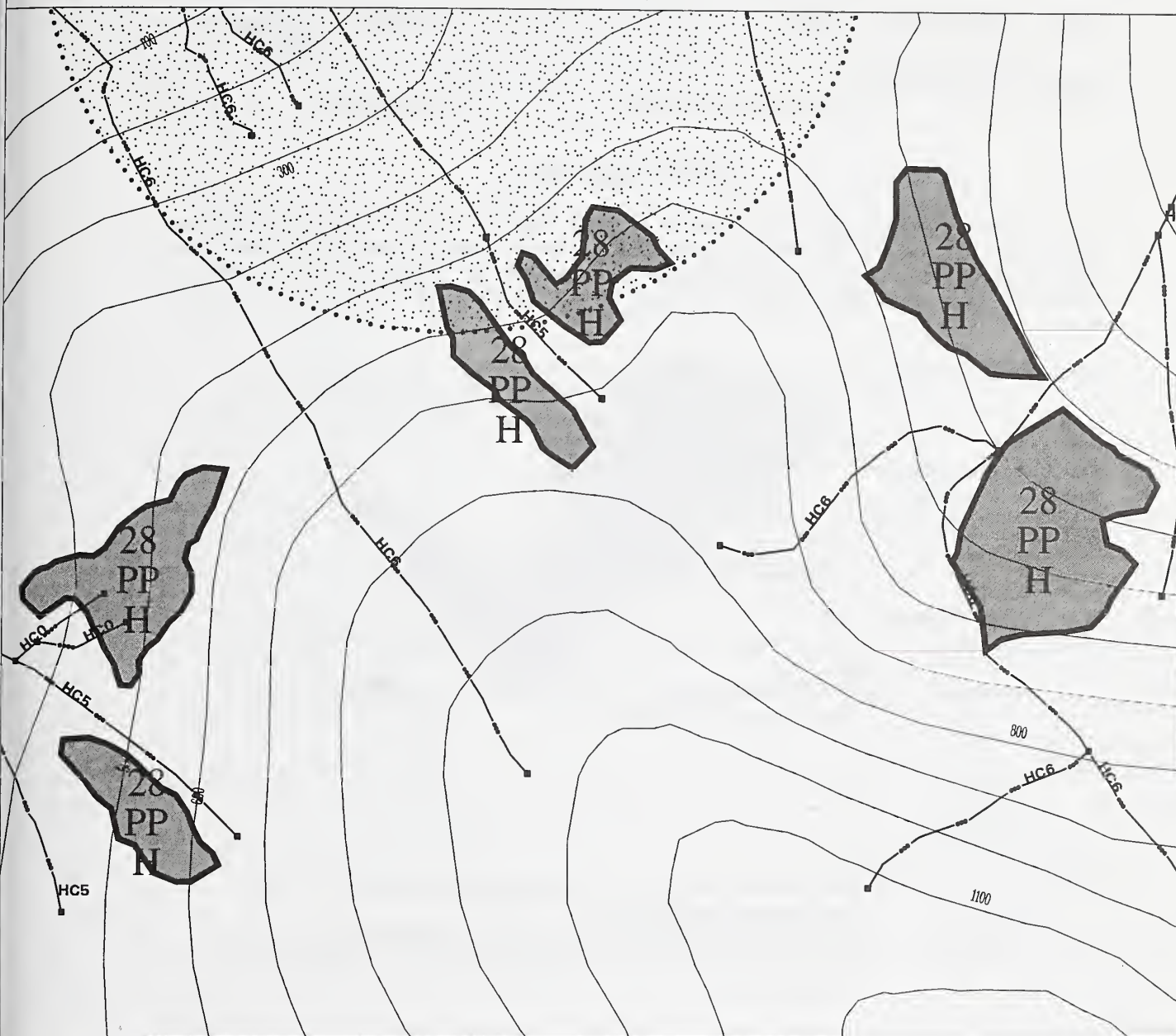


# A -Unit Cards and Extra Alternative Maps

UNIT 28

ALTERNATIVE 1, 3 & 4

21 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 31      In Alternatives 1, 3 & 4

Harvest method Helicopter

Total Acres 14      Volume per Acre 14.6 MBF      Total Unit Volume 205 MBF

## UNIT DEVELOPMENT

Parts of unit are visible from the Blake Island area. Unit is an irregular shaped area with the south portion adjacent to the Tyee power line. There are several Class IV streams in the unit and a Class III stream runs parallel with the north side boundary. The diameter limit prescription will minimize the impact to visuals. Western portion of unit dropped because of very low volume. Unit designed to harvest dead yellow cedar trees.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention. |
| Silvicultural Prescription:  | Helicopter with diameter limit.  |
| Regeneration Method:         | Natural.   |
| Possible Future Treatments:  | Pre-commercial thinning  |

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

|             |  |
|-------------|--|
| Concern:    | Class III stream is tributary to Flying V Creek. Class IV streams within unit.                       |
| Mitigation: | No harvest within notch of Class III stream. Helicopter yarding achieves Class IV stream protection. |

### Soils

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

### Wildlife

|             |  |
|-------------|--|
| Concern:    | Small mammal dispersal. Loss of large trees for nesting and denning. Travel corridor. Fragmentation.   |
| Mitigation: | Reserves trees within the unit will maintain structural diversity. Younger stand component and leave trees retained. Unit designed to leave corridor intact. |

### Anan Bears

|             |  |
|-------------|--|
| Concern:    | Noise of helicopter yarding during denning and during tourist season.  |
| Mitigation: | Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season. |

### Visuals

|             |   |
|-------------|---|
| Concern:    | Appearance of unit from Bradfield Canal.                                |
| Mitigation: | Diameter limits will retain trees in unit, North boundary is irregular. |

### Special Contract Concerns

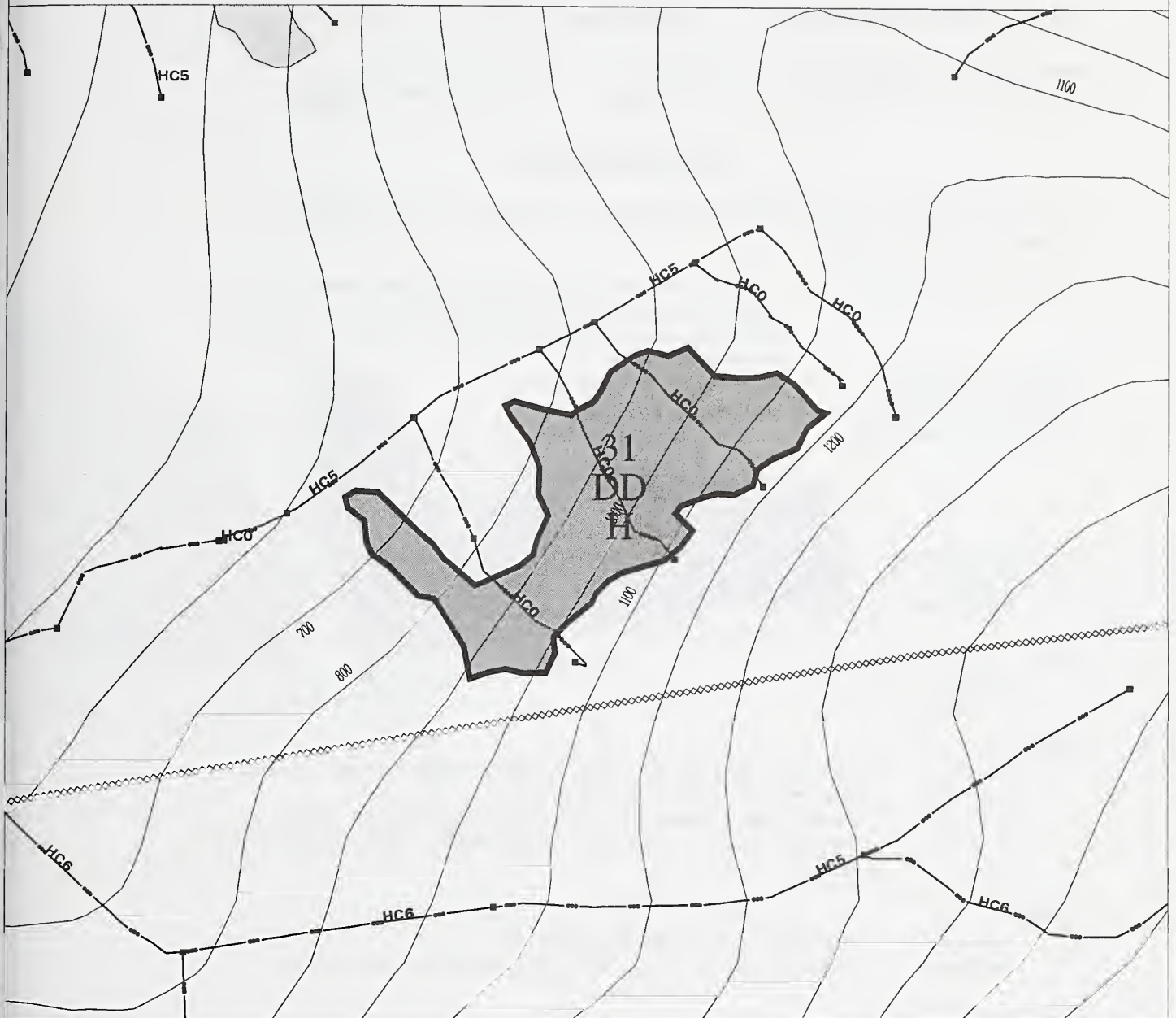
|  |                                  |
|--|----------------------------------|
|  | Ensure stream buffers protected. |
|--|----------------------------------|

# A -Unit Cards and Extra Alternative Maps

UNIT 31

ALTERNATIVE 1, 3 & 4

14 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 33

In Alternative 4

Harvest method Helicopter

Total Acres 22

Volume per Acre 17.7 MBF

Total Unit Volume 389 MBF

## UNIT DEVELOPMENT

Unit is split by Flying V Creek tributaries which require V-notch buffers. South boundary of unit is adjacent to the Tyee power line.

Stand Management Objectives: Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 25% retention.

Silvicultural Prescription: Helicopter with diameter limit.

Regeneration Method: Natural.

Possible Future Treatments: Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/Fisheries

Concern: Flying V Creek tributaries (Class III, HC6) flow through unit.

Mitigation: No harvest within notch of Class III streams.

### Soils

Concern: none.

Mitigation:

### Wildlife

Concern: Small mammal dispersal. Forested corridor beneath powerline. Loss of large trees for nesting and denning. Fragmentation.

Mitigation: Reserve trees within the unit will maintain some structural diversity. Younger stand component and leave trees retained. Stream buffer provides habitat.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Diameter limit reduces the effects of harvest on the visual resource.

### Special Contract Concerns

Ensure stream buffers protected.

UNIT 33

ALTERNATIVE 4

22 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 34

In Alternatives 1 & 3

Harvest method Helicopter

Total Acres 8

Volume per Acre 13.0 MBF

Total Unit Volume 104 MBF

## UNIT DEVELOPMENT

Unit was reduced in size due to low timber volume. Unit is mapped as forested wetlands.

Stand Management Objectives: Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription: Helicopter with diameter limit.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Verify possible Class III or Class IV stream east of unit.

Mitigation: No harvest within notch of Class III stream. Helicopter yarding provides Class IV stream protection.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Small mammal dispersal. Loss of large trees for nesting and denning. Fragmentation.

Mitigation: Reserve trees within the unit will maintain structural diversity. Younger stand component and leave trees retained.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Diameter limit reduces the effects of harvest on the visual resource.

### Special Contract Concerns

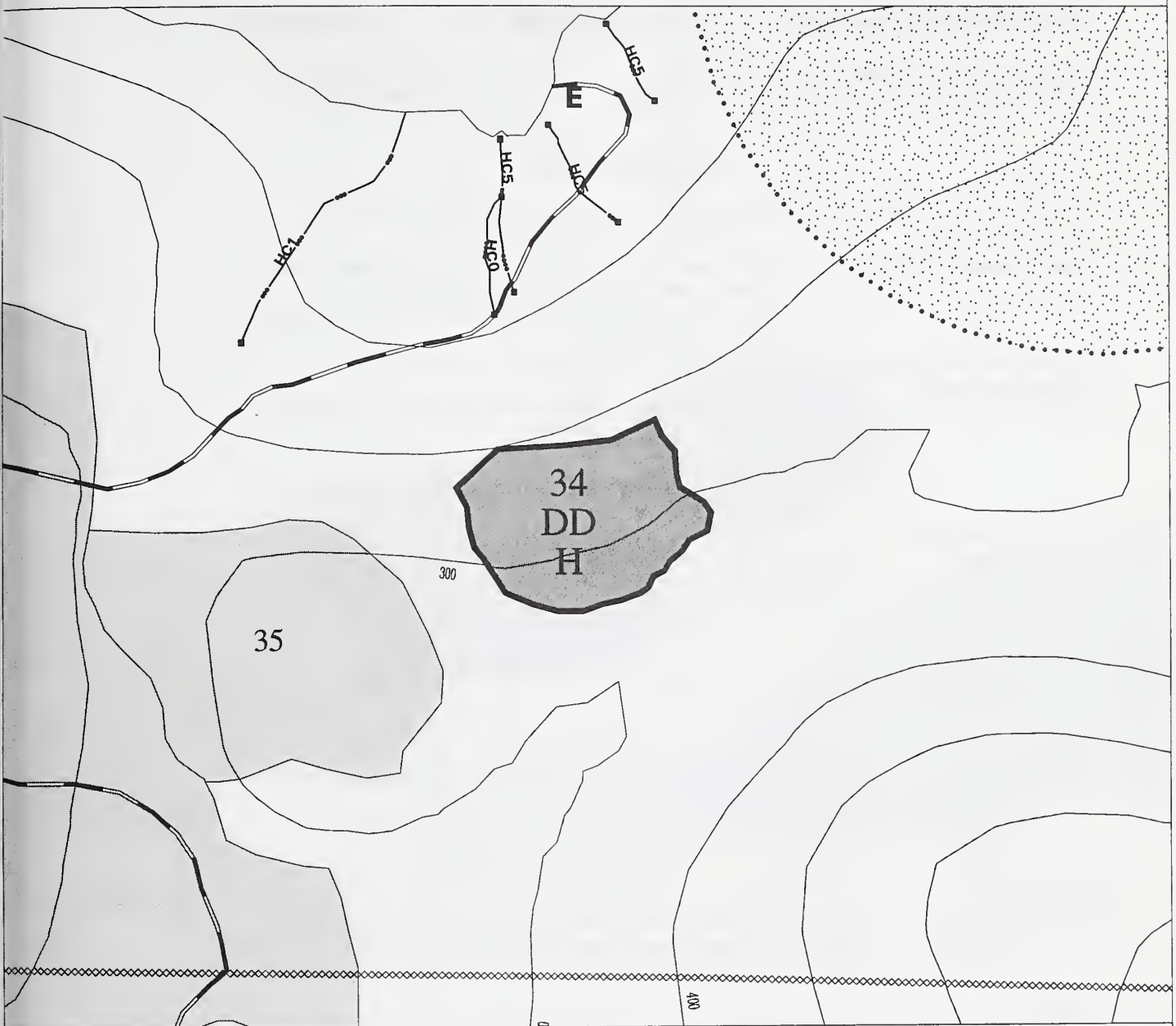
Ensure stream buffer protected.



UNIT 34

ALTERNATIVE 1 & 3

8 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: December 05, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 34

In Alternative 4

Harvest method Helicopter

Total Acres 23

Volume per Acre 14.0 MBF

Total Unit Volume 322 MBF

## UNIT DEVELOPMENT

Unit was reduced in size due to low timber volume. Unit is mapped as forested wetlands.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 30% retention.

Silvicultural Prescription: Helicopter with diameter limit.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Verify possible Class III or Class IV stream east of unit.

Mitigation: No harvest within notch of Class III stream. Helicopter yarding provides Class IV stream protection.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Small mammal dispersal. Loss of large trees for nesting and denning. Fragmentation.

Mitigation: Reserve trees within the unit will maintain structural diversity. Younger stand component and leave trees retained.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Diameter limit reduces the effects of harvest on the visual resource.

### Special Contract Concerns

Ensure stream buffer protected.

UNIT 34

ALTERNATIVE 4

23 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: December 05, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale      Unit Number 35      In Alternative 1

Harvest method Helicopter

Helicopter Acres 16      Volume per Acre 14.8 MBF      Total Helicopter Volume 237 MBF

Harvest method Cable

Cable Acres 65      Volume per Acre 15.2 MBF      Total Cable Volume 972 MBF

## UNIT DEVELOPMENT

Unit is adjacent to Cowboy Creek (Class II stream) on west side. Northern and parts of west boundary are adjacent to beach buffer. Southern boundary of unit adjacent to the Tyee power line. Unit includes 23 acres of forested wetlands and a small sedge muskeg.

Stand Management Objectives:      Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription:      Helicopter with diameter limit in unit 35.1 and clearcut with reserves in unit 35.2.

Regeneration Method:      Natural. Consider planting spur road with alder or spruce.

Possible Future Treatments:      Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern:      Class II stream is MM1 and FP3. Verify buffer width during layout.

Mitigation:      No timber harvest within floodplain. Includes no timber harvest within 100 horizontal feet of stream. No harvest within 130 feet of FP3 stream or within 120 feet of MM1 stream. Fisheries specialist will assist with buffer layout.

### Soils

Concern:      none

Mitigation:

### Wildlife

Concern:      Improved access: impact to bear population and habituated bears. Unit adjacent to beach buffer. Deer marten and forest songbird habitat values.

Mitigation:      Close roads after logging with gate and closure order. Locate unit boundary at least 1000 feet from beach. Reserve trees within the unit will maintain structural diversity and are placed west of the road. Highest habitat values within the beach buffer.

### Anan Bears

Concern:      Noise of helicopter yarding during denning and during tourist season.

Mitigation:      Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern:      Appearance from Bradfield Canal.

Mitigation:      Reserve trees will reduce visual impacts.

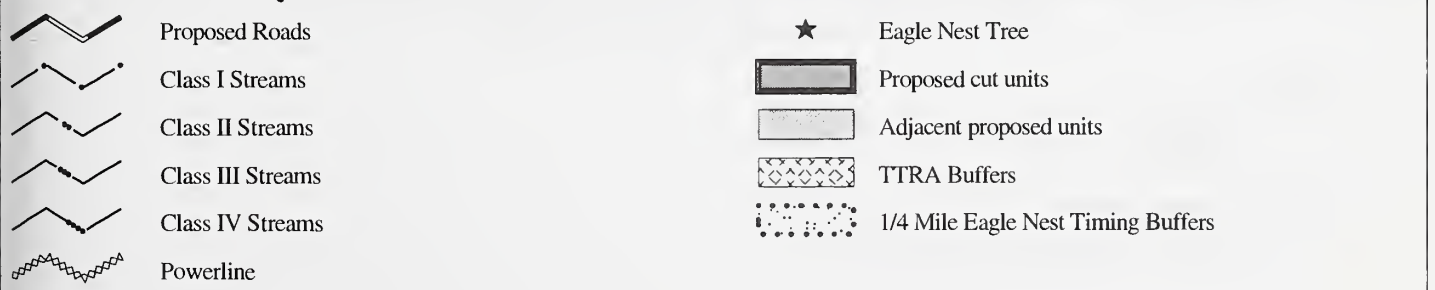
### Special Contract Concerns

Ensure stream buffers protected.

UNIT 35

ALTERNATIVE 1

81 ACRES



**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: December 05, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 35

In Alternative 2

Harvest method Cable

Total Acres 47

Volume per Acre 14.8 MBF

Total Unit Volume 695 MBF

## UNIT DEVELOPMENT

Unit is adjacent to Cowboy Creek (Class II) on west side. Northern and parts of west boundary are adjacent to beach buffer. Unit will be cable yarded. Southern boundary of unit adjacent to the Tye power line. Unit includes about 9 acres of forested and nonforested wetland complex and a small sedge muskeg.

Stand Management Objectives: Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription: Clearcut with reserves.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, and pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class II stream is MM1 and FP3. Verify buffer width during layout.

Mitigation: No timber harvest within floodplain. Includes no timber harvest within 100 horizontal feet of stream. No harvest within 130 feet of FP3 stream or within 120 feet of MM1 stream. Fisheries specialist will assist with buffer layout.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Unit adjacent to beach buffer and beach corridor. Deer, marten and forest songbird habitat values. Improved access may impact bear populations and habituated bears.

Mitigation: Locate unit boundary at least 1000 feet from beach. Reserves trees within the unit will maintain structural diversity. Highest habitat values within the beach buffer. Place 2-4 reserves west of the road and adjacent to estuary. Close roads after logging with gate and closure order.

### Visuals

Concern: none

Mitigation:

### Special Contract Concerns

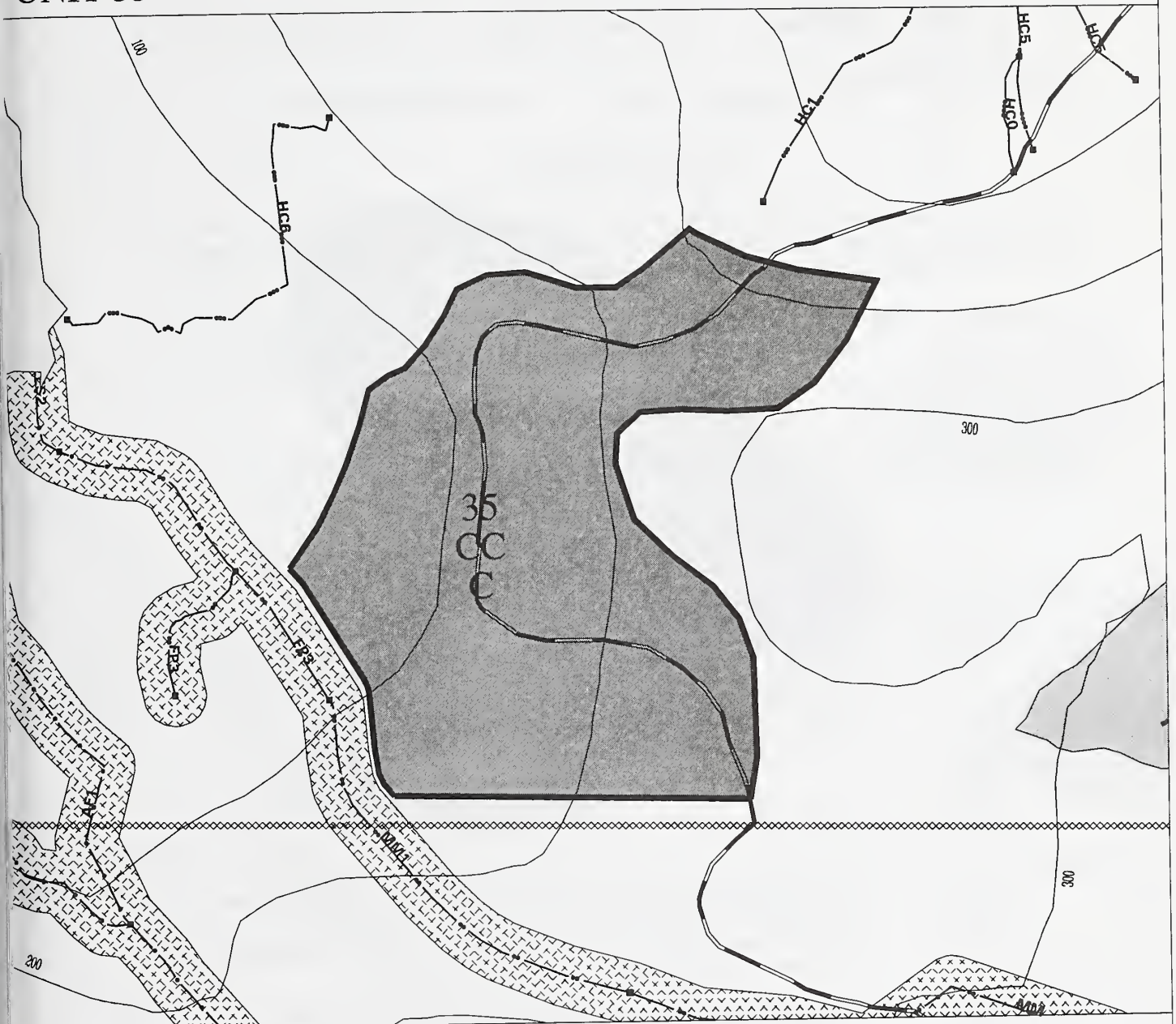
Ensure the beach buffers are protected.



UNIT 35

ALTERNATIVE 2

47 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 500 1000 feet

Scale is 1 inch = 0.09 miles

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

Last Updated: December 05, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 35

In Alternative 3

Harvest method Helicopter

Total Acres 57

Volume per Acre 15.0 MBF

Total Unit Volume 857 MBF

## UNIT DEVELOPMENT

Portion of northern boundary is adjacent to beach buffer . Southern boundary is adjacent to Tyee power line. Southwest corner of unit is adjacent to Cowboy Creek (Class II). There is a patch of about 13 acres of non-wetland/forested wetland complex within the unit.

|                              |  |
|------------------------------|--|
| Stand Management Objectives: | Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. |
| Silvicultural Prescription:  | Helicopter with diameter limit.  |
| Regeneration Method:         | Natural.   |
| Possible Future Treatments:  | Release, possible planting, and pre-commercial thinning.   |

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

|             |   |
|-------------|---|
| Concern:    | Class II stream is MM1 and FP3. Verify buffer width during layout.  |
| Mitigation: | No timber harvest within floodplain. Includes no timber harvest within 100 horizontal feet of stream. No harvest within 130 feet of FP3 stream or within 120 feet of MM1 stream. Fisheries specialist will assist with buffer layout. |

### Soils

|             |      |
|-------------|------|
| Concern:    | none |
| Mitigation: |      |

### Wildlife

|             |   |
|-------------|---|
| Concern:    | Unit adjacent to beach buffer and beach corridor. Deer, marten, and forest songbird habitat values.   |
| Mitigation: | Ensure unit boundary at least 1000' from the beach. Highest habitat value is within the beach buffer. |

### Anan Bears

|             |  |
|-------------|--|
| Concern:    | Noise of helicopter yarding during denning and during tourist season.  |
| Mitigation: | Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season. |

### Visuals

|             |  |
|-------------|--|
| Concern:    | Appearance of unit from Bradfield Canal.                           |
| Mitigation: | Leave trees in clumps to help meet the visual the visual resource. |

### Special Contract Concerns

Ensure stream and beach buffers protected.



# A -Unit Cards and Extra Alternative Maps

UNIT 35

ALTERNATIVE 3

57 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

PRESCRIPTIONS  
CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

HARVEST SYSTEMS  
C = Cable  
H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: December 05, 1997



# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 36

In Alternative 2

Harvest method Cable

Total Acres 52

Volume per Acre 20.2 MBF

Total Unit Volume 1,072 MBF

## UNIT DEVELOPMENT

Portion of southern boundary is adjacent to Tyee power line. Flying V Creek flows east of unit.

Stand Management Objectives: Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription: Helicopter with diameter limit in Alternatives 3 & 4. Cable with reserves and feather backline in Alternative 2.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Flying V Creek east of unit (Class III HC6).

Mitigation: No harvest within notch of stream.

### Soils

Concern: Inclusion of oversteepened slopes in the unit.

Mitigation: Field verify site stability prior to layout.

### Wildlife

Concern: Small mammal dispersal. Loss of large trees for nesting and denning. Fragmentation. Improved access in Alternative 2 may increase bear harvest and impact population and habituate bears.

Mitigation: Reserve trees within the unit will maintain structural diversity. Close roads after logging. Reserve trees will maintain some structural diversity and promote a large tree component in the regenerating stand.

### Anan Bears

Concern: Noise of helicopter yarding during denning tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in the unit will reduce the effects of harvest on the visual resource in Alternatives 3 and 4. The reserves and uphill yarding will help in Alternative 2.

### Special Contract Concerns

Ensure stream buffers protected.

# A -Unit Cards and Extra Alternative Maps

UNIT 36

ALTERNATIVE 2

52 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

## PRESCRIPTIONS

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

## HARVEST SYSTEMS

C = Cable  
H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 36

In Alternatives 3 & 4

Harvest method Helicopter

Total Acres 52

Volume per Acre 20.2 MBF

Total Unit Volume 1,072 MBF

## UNIT DEVELOPMENT

Portion of southern boundary is adjacent to Tyee power line. Flying V Creek flows east of unit.

Stand Management Objectives: Future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.

Silvicultural Prescription: Helicopter with diameter limit in Alternatives 3 & 4. Cable with reserves and feather backline in Alternative 2.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Flying V Creek east of unit (Class III HC6).

Mitigation: No harvest within notch of stream.

### Soils

Concern: Inclusion of oversteepened slopes in the unit.

Mitigation: Field verify site stability prior to layout.

### Wildlife

Concern: Small mammal dispersal. Loss of large trees for nesting and denning. Fragmentation. Improved access in Alternative 2 may increase bear harvest and impact population and habituate bears.

Mitigation: Reserve trees within the unit will maintain structural diversity. Close roads after logging. Reserve trees will maintain some structural diversity and promote a large tree component in the regenerating stand.

### Anan Bears

Concern: Noise of helicopter yarding during denning tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in the unit will reduce the effects of harvest on the visual resource in Alternatives 3 and 4. Reserves and uphill yarding will help in Alternative 2.

### Special Contract Concerns

Ensure stream buffers protected.




## A -Unit Cards and Extra Alternative Maps





UNIT 36

## ALTERNATIVE 3 & 4

52 ACRES



- 
- |  |                   |
|--|-------------------|
|  | Proposed Roads    |
|  | Class I Streams   |
|  | Class II Streams  |
|  | Class III Streams |
|  | Class IV Streams  |
|  | Powerline         |

- |   |                                    |
|---|------------------------------------|
| ★   | Eagle Nest Tree                    |
|  | Proposed cut units                 |
|  | Adjacent proposed units            |
|  | TTRA Buffers                       |
|  | 1/4 Mile Eagle Nest Timing Buffers |

## E Proposed LTF Sites

HC1,MM3,... Channel Types

## PRESCRIPTIONS

CC = Clearcut

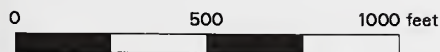
DD = Diameter Limits

PP = Patch Cut

## HARVEST SYSTEMS

C = Cable

H = Helicopter



Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 38

In Alternatives 1 & 2

Harvest method Cable

Total Acres 33

Volume per Acre 19.7 MBF

Total Unit Volume 649 MBF

## UNIT DEVELOPMENT

Unit designed to meet the visual quality objectives of partial retention. North and east portion of unit is adjacent to high hazard soils. Road goes through unit and provides access to additional units in Alternative 2. Unit size and shape were designed to avoid low volume, poor quality timber.

Stand Management Objectives:      Alternative 2 future stand to have at least two canopy layers. Stand will be predominately even aged. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 10% retention.  
Alternative 1 future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 30% retention.

Silvicultural Prescription:      Alternative 2: Clearcut with reserves partial harvest with diameter limit to feather backline.  
Alternative 1: Clearcut with 30% reserves and a feathered backline.

Possible Future Treatments:      Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: none

Mitigation:

### Soils

Concern: Steep slopes on southeast side of unit.

Mitigation: Unit located to avoid slopes > 72%.

### Wildlife

Concern: Improved access may impact bear populations and habituated bears. Forest songbirds, corridor and deer winter range habitat values.

Mitigation: Close roads after logging with gates and closure order. Place reserves within unit. Maintain canopy cover in backline. Higher retention will help maintain winter range values.

### Visuals

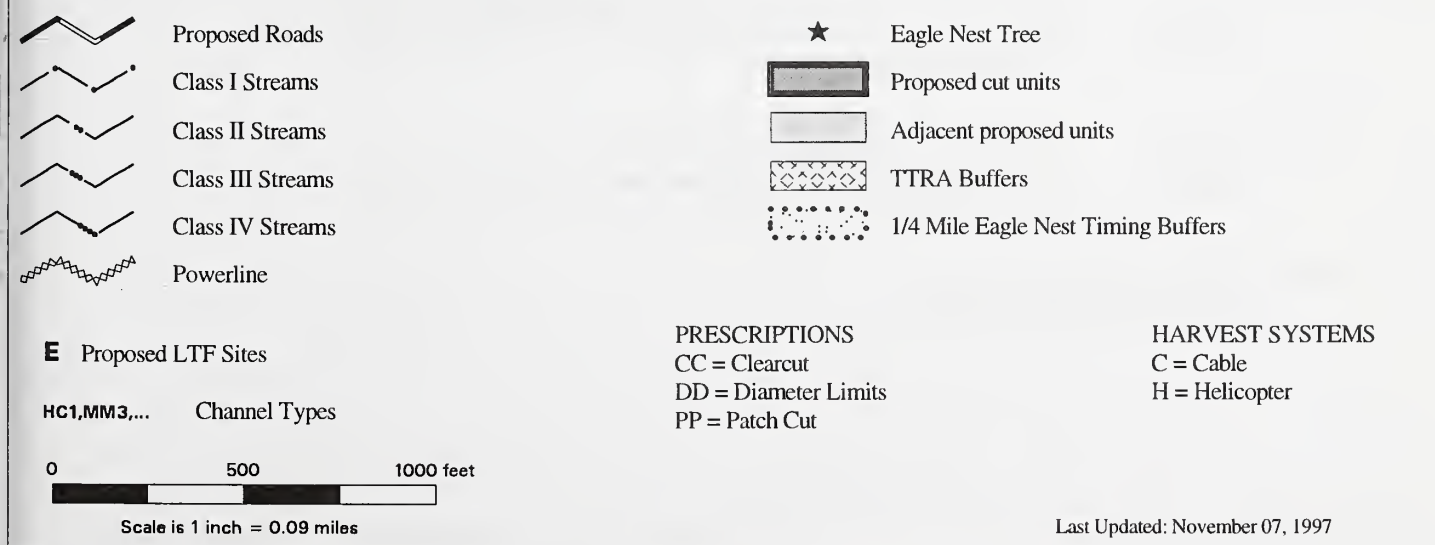
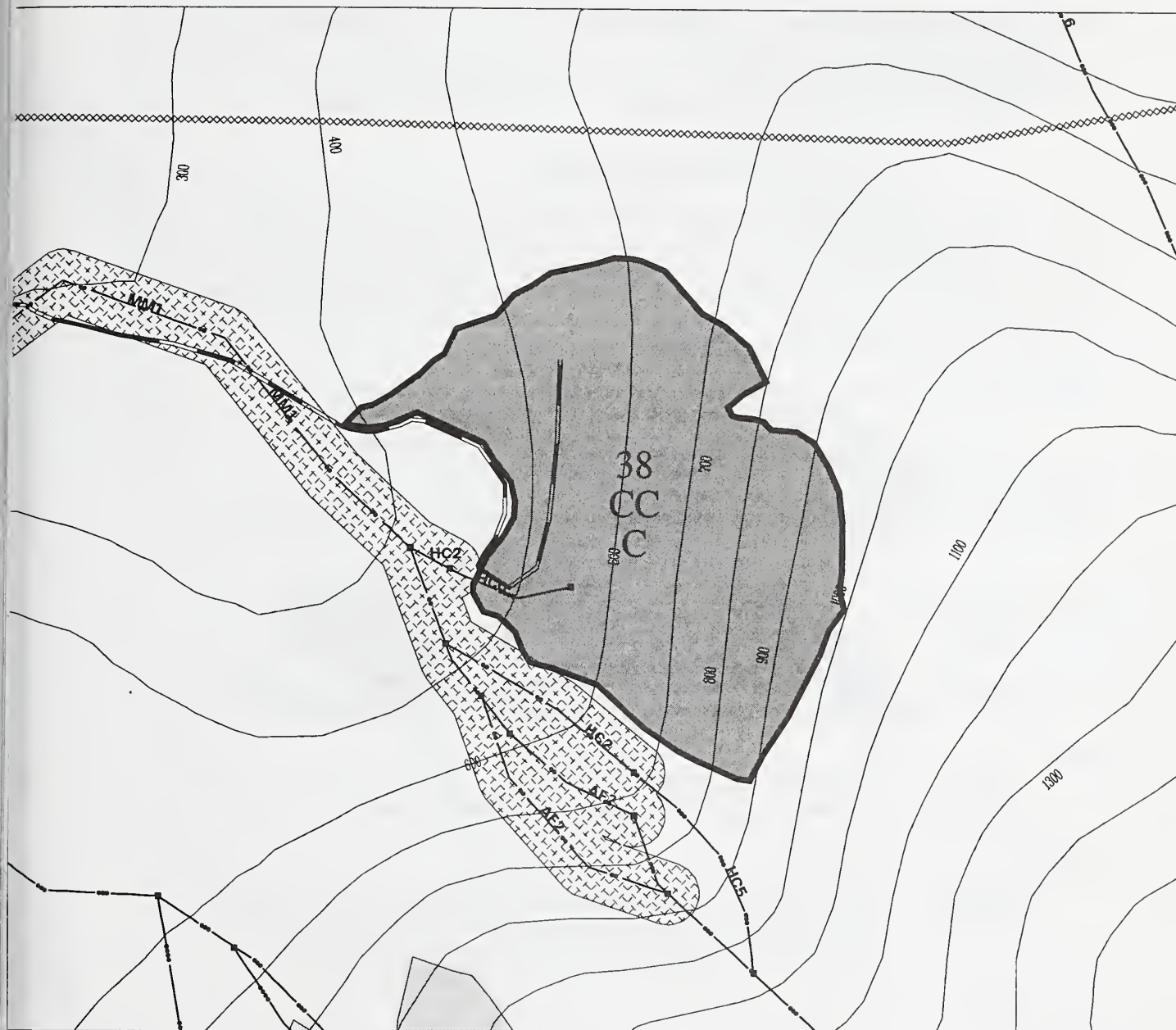
Concern: none

Mitigation:

UNIT 38

ALTERNATIVE 1 & 2

33 ACRES





# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 41

In Alternatives 1

Harvest method Helicopter

Total Acres 22

Volume per Acre 16.4 MBF

Total Unit Volume 360 MBF

## UNIT DEVELOPMENT

Unit is visible from the Marten Creek area of the Bradfield Canal. Unit designed to buffer Class III streams. Unit designed to meet the visual quality objective of partial retention. There are about 5 acres of forest wetlands included in this unit. This unit is helicopter yarded with a diameter limit. Logs will be flown to landing in unit 38. The irregular shape and diameter limit harvest will help the unit to meet the visual quality objective. Retention will help maintain bear habitat effectiveness. Closing roads to access other units in the Canal drainage will restrict access.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation.

Silvicultural Prescription: Upper and lower diameter limits in helicopter portion.

Regeneration Method: Natural

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Stream west of unit is Class III, HC6 (Bear Creek). Streams within unit are small Class III (HC5) and Class IV streams.

Mitigation: No timber harvest within notch of Class III streams. Unit design, temporary road location (or helicopter yarding) provides Class IV stream protection.

### Soils

Concern: Steep slopes and muskegs.

Mitigation: Unit was shaped to avoid steep slopes and muskeg stringer.

### Wildlife

Concern: Improved road access. Bear denning potential.

Mitigation: Close roads after logging with gates and closure order. Create 2-3 reserves (8-16 acres) within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. On downed trees retain at least 15' of butt log attached to the rootwad.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of Unit from Bradfield Canal

Mitigation: Leaving trees in the unit using a diameter limit and 40% retention will help meet the visual quality objective.

### Special Contract Concerns

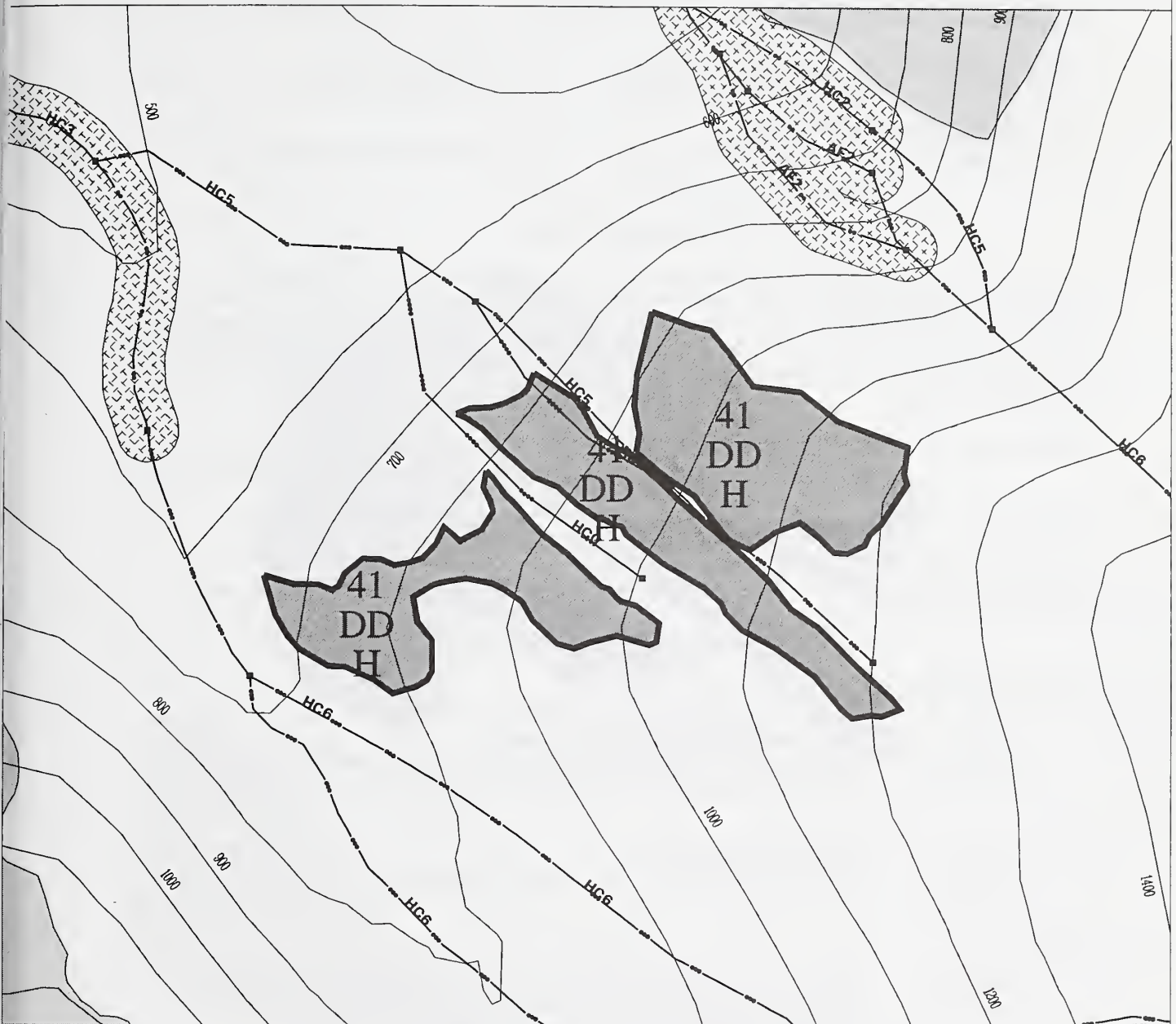
Ensure stream buffers protected.

# A -Unit Cards and Extra Alternative Maps

UNIT 41

ALTERNATIVE 1

22 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

**CANAL HOYA Timber Sale**

Unit Number **41**

In Alternative **2**

Harvest method Cable

Cable Acres 18

Volume per Acre 15.8 MBF

Cable Unit Volume 284 MBF

Harvest method Helicopter

Helicopter Acres 22

Volume per Acre 16.4 MBF

Helicopter Unit Volume 360 MBF

### UNIT DEVELOPMENT

Unit is visible from the Marten Creek area of the Bradfield Canal. Unit designed to buffer Class III streams. Unit designed to meet the visual quality objective of partial retention. There are about 5 acres of forest wetlands included in this unit. The upper portion of this unit is helicopter yarded with a diameter limit. The low portions of the unit are cable yarded with 10% retention. The irregular shape and diameter limit harvest will help the unit to meet the visual quality objective. Retention will help maintain bear habitat effectiveness.

|                              |   |
|------------------------------|---|
| Stand Management Objectives: | Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. |
| Silvicultural Prescription:  | Cable Portion will have reserves. Upper and lower diameter limits in helicopter portion.  |
| Regeneration Method:         | Natural   |
| Possible Future Treatments:  | Release, possible planting, pre-commercial thinning, and pruning.   |

### RESOURCE CONCERNS & MITIGATION

#### Water Quality Fisheries

|             |  |
|-------------|--|
| Concern:    | Stream west of unit is Class III, HC6 (Bear Creek). Streams within unit are small Class III (HC5) and Class IV streams.                                |
| Mitigation: | No timber harvest within notch of Class III streams. Unit design, temporary road location (or helicopter yarding) provides Class IV stream protection. |

#### Soils

|             |  |
|-------------|--|
| Concern:    | Steep slopes and muskegs.                                  |
| Mitigation: | Unit was shaped to avoid steep slopes and muskeg stringer. |

#### Wildlife

|             |   |
|-------------|---|
| Concern:    | Improved road access. Bear denning potential.   |
| Mitigation: | Close roads after logging with gates and closure order. Create 2-3 reserves (8-16 acres) within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. On downed trees retain at least 15' of butt log attached to the rootwad. |

#### Anan Bears

|             |  |
|-------------|--|
| Concern:    | Noise of helicopter yarding during denning and during tourist season.  |
| Mitigation: | Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season. |

#### Visuals

|             |   |
|-------------|---|
| Concern:    | Appearance of Unit from Bradfield Canal   |
| Mitigation: | Leaving trees in the unit using a diameter limit and 40% retention will help meet the visual quality objective. |

Special Contract Concerns: Ensure stream buffers are protected.

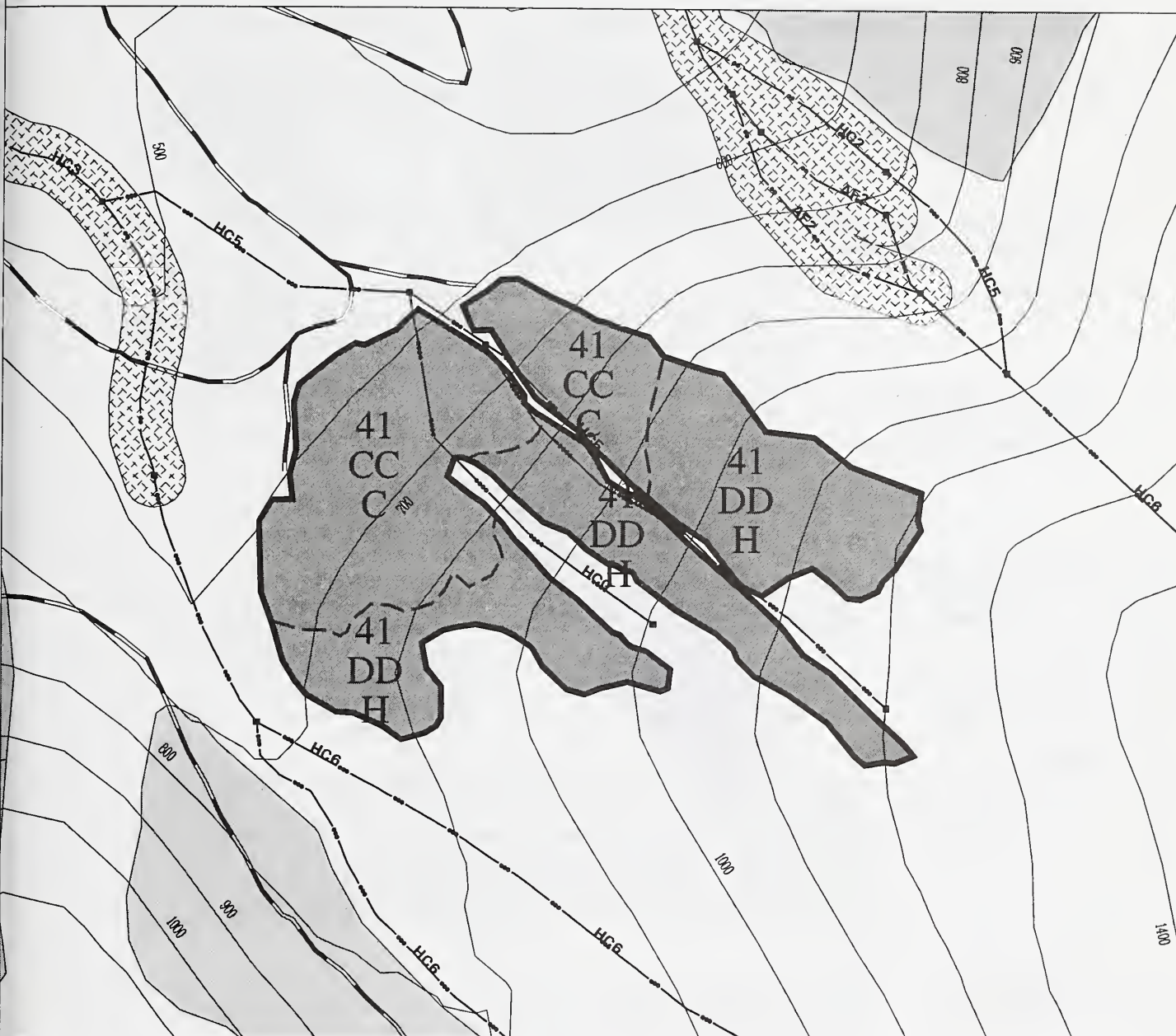


# A -Unit Cards and Extra Alternative Maps

UNIT 41

ALTERNATIVE 2

40 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 43

In Alternative 2

Harvest method Cable

Total Acres 58

Volume per Acre 22.5 MBF

Total Unit Volume 1,303 MBF

## UNIT DEVELOPMENT

Unit has portions of east boundary adjacent to Bear Creek tributary. The reserves in this alternative will help meet the visual objectives.

Stand Management Objectives: Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation.

Silvicultural Prescription: Clearcut with 20% retention. Stagger and feather backline.

Regeneration Method: Natural.

Possible Future Treatments: Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Bear Creek (Class III HC6) east of unit.

Mitigation: No harvest within notch of Bear Creek.

### Soils

Concern:

Mitigation:

### Wildlife

Concern: Improved road access for bear hunters . Bear denning potential. Deer winter range values.

Mitigation: Close roads after logging with gates and closure order. Create 5-6 reserves (12 acres total) within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. On down trees retain at least 15' of the butt log attached to the rootwad.

### Visuals

Concern: View from Bradfield Canal.

Mitigation: Retention will help accomplish the visual quality objective.

### Special Contract Concerns

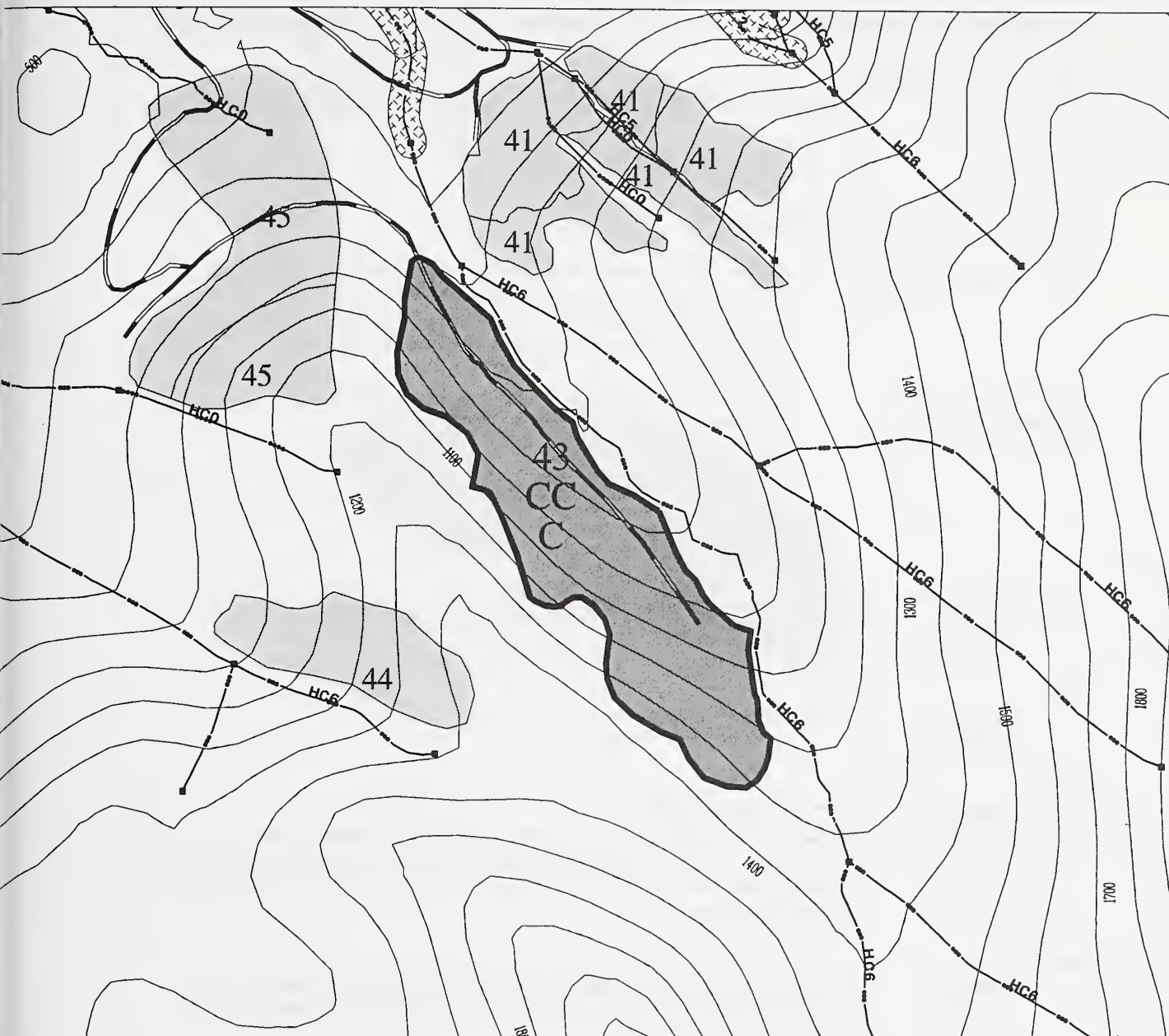
Ensure stream buffers protected.

# A -Unit Cards and Extra Alternative Maps

UNIT 43

ALTERNATIVE 2

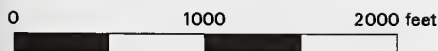
58 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types



Scale is 1 inch = 0.18 miles

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number **44**

In Alternatives **1 & 2**

Harvest method Helicopter

Total Acres 17

Volume per Acre 24.2 MBF

Total Unit Volume 412 MBF

## UNIT DEVELOPMENT

Retention in the unit is high to maintain habitat for Anan bears.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 40% retention. Harvest unit while leaving a mix of species.

Silvicultural Prescription: Helicopter, upper and lower diameter limit and reserves.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality Fisheries

Concern: Class III stream south of unit is HC6 tributary to Canal Creek.

Mitigation: No harvest with notch of Class III stream.

### Soils

Concern: No concerns as planned

Mitigation:

### Wildlife

Concern: Bear denning potential.

Mitigation: Create 3-4 reserves within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. On down trees retain 15' of butt log attached to rootwad. Leave 6' stumps of potential den trees.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of Unit from Bradfield Canal.

Mitigation: Leave trees in unit to help meet the visual quality objective.

### Special Contract Concerns

Ensure stream buffers are protected.

# A -Unit Cards and Extra Alternative Maps

UNIT 44

ALTERNATIVE 1 & 2

17 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 45

In Alternative 1

Harvest method Helicopter

Total Acres 25

Volume per Acre 17.8 MBF

Total Unit Volume 444 MBF

## UNIT DEVELOPMENT

Unit will be helicopter yarded. This alternative will only harvest ground that could not be accessed by cable yarding in the future. Retention in the unit was increased in Alternative 1 to maintain habitat for Anan bears.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 40% retention.  
Harvest unit while leaving a mix of species.  
Silvicultural Prescription: Cable portion will have reserves. Upper and lower diameter limits and reserves in the helicopter portion.  
Regeneration Method: Natural.  
Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Verify Class III or IV streams tributary to Canal Creek within or adjacent to unit during layout.  
Mitigation: No harvest within notch of Class III stream. Unit design (road location and helicopter yarding provides protection to both Class III and Class IV streams.

### Soils

Concern: none  
Mitigation:

### Wildlife

Concern: Improved road access to bear populations and habituated bears . Bear denning potential.  
Mitigation: Close roads after logging with gates and closure order. Create 2-3 reserves within the unit that contain suitable denning trees (>40" DBH).  
Avoid removing large trees with cavities, downed logs or snags.  
Retain 15' of butt logs attached to rootwads. Leave 6' stumps of potential den trees.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.  
Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.  
Mitigation: Leave trees in unit to help meet the visual quality objective.

### Special Contract Concerns

Ensure stream buffers protected.

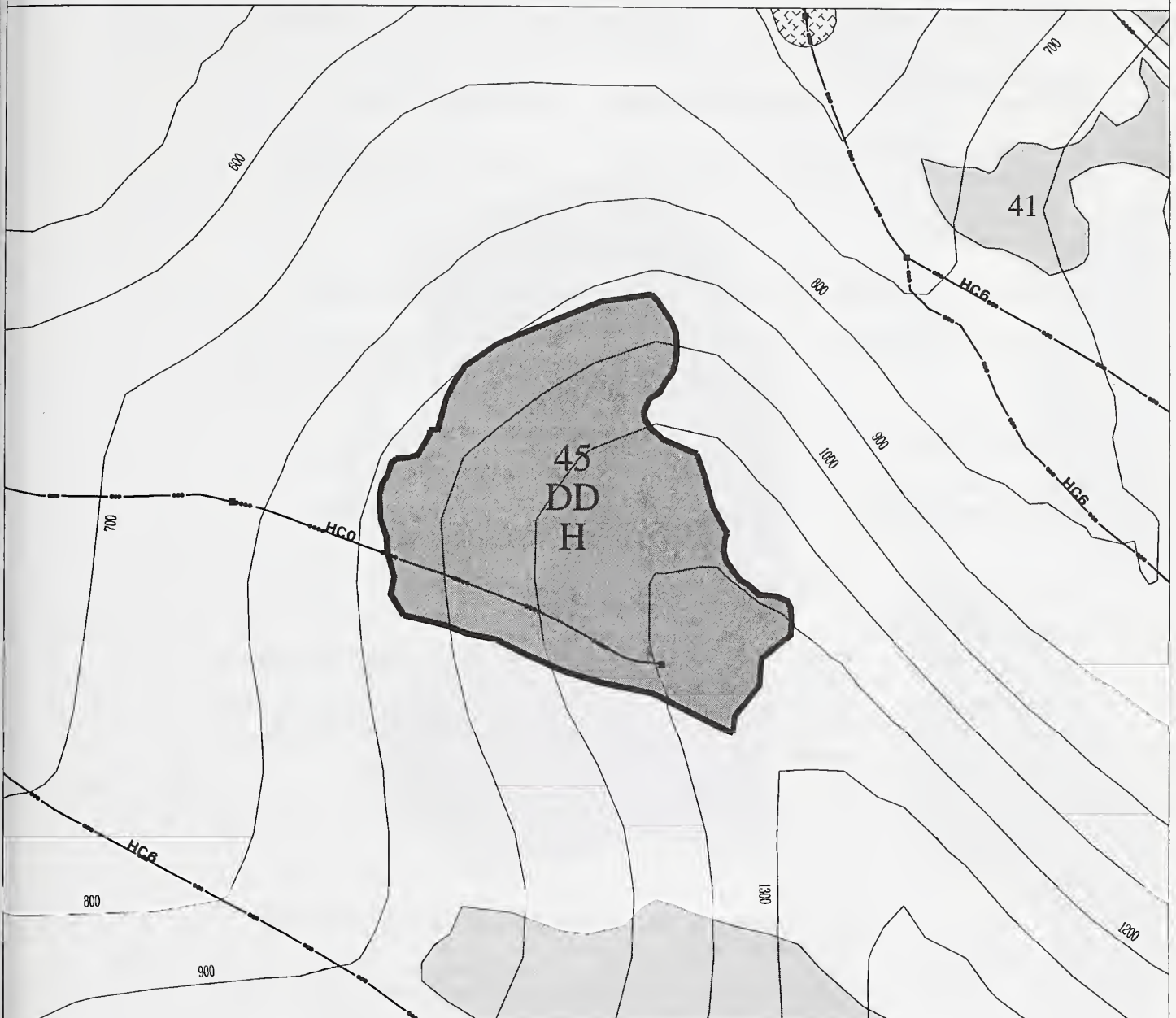


# A -Unit Cards and Extra Alternative Maps

UNIT 45

ALTERNATIVE 1

25 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

**PRESCRIPTIONS**  
 CC = Clearcut  
 DD = Diameter Limits  
 PP = Patch Cut

**HARVEST SYSTEMS**  
 C = Cable  
 H = Helicopter

0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997

# A -Unit Cards and Extra Alternative Maps

CANAL HOYA Timber Sale

Unit Number 45

In Alternative 2

Harvest method Cable

Cable Acres 33

Volume per Acre 16.1 MBF

Cable Volume 532 MBF

Harvest method Helicopter

Helicopter Acres 13

Volume per Acre 18.7 MBF

Helicopter Volume 224 MBF

## UNIT DEVELOPMENT

Northern portion of unit will be cable yarded and southern portion will be helicopter yarded.

Stand Management Objectives: Future stand to have several canopy layers and at least two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 15% retention .

Silvicultural Prescription: Cable portion will have reserves. Upper and lower diameter limits and reserves in the helicopter portion.

Regeneration Method: Natural.

Possible Future Treatments: Release, possible planting, pre-commercial thinning, and pruning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Verify Class III or IV streams tributary to Canal Creek within or adjacent to unit during layout.

Mitigation: No harvest within notch of Class III stream. Unit design (road location and helicopter yarding provides protection to both Class III and Class IV streams.

### Soils

Concern: none

Mitigation:

### Wildlife

Concern: Improved road access to bear populations and habituated bears. Bear denning potential.

Mitigation: Close roads after logging with gates and closure order. Create 2-3 reserves within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. Retain 15' of butt logs attached to rootwads. Leave 6' stumps of potential den trees.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Leave trees in unit to help meet the visual quality objective.

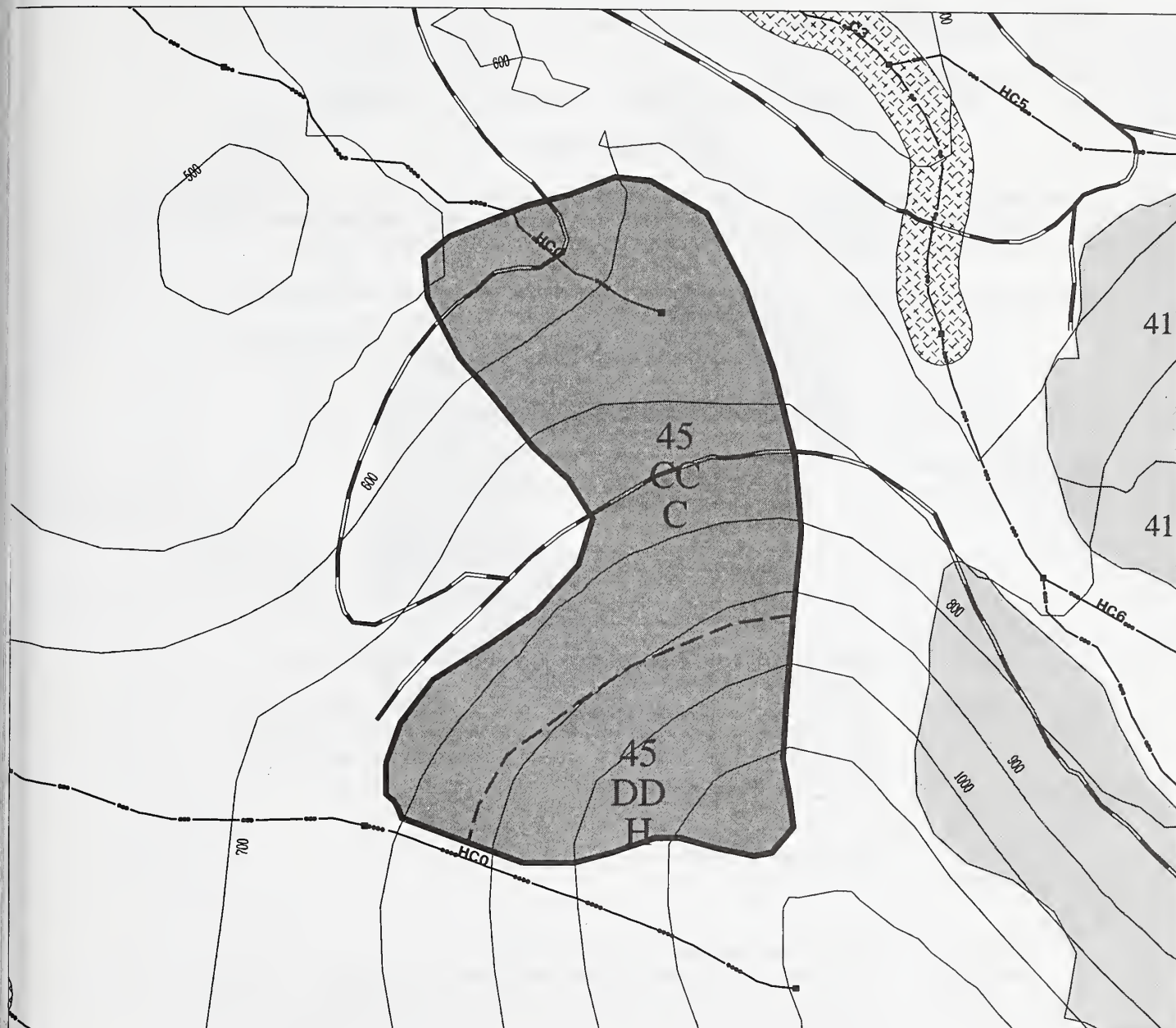
### Special Contract Concerns

Ensure stream buffers protected.

UNIT 45

ALTERNATIVE 2

46 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

0 500 1000 feet

Scale is 1 inch = 0.09 miles

★ Eagle Nest Tree

Proposed cut units

Adjacent proposed units

TTRA Buffers

1/4 Mile Eagle Nest Timing Buffers

## PRESCRIPTIONS

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

## HARVEST SYSTEMS

C = Cable  
H = Helicopter

Last Updated: November 07, 1997



# A -Unit Cards and Extra Alternative Maps

**CANAL HOYA Timber Sale**

Unit Number 47

In Alternative 1

Harvest method Helicopter

Total Acres 23

Volume per Acre 14.6 MBF

Total Unit Volume 336 MBF

## UNIT DEVELOPMENT

Unit has irregular shaped boundary. South and east boundaries provide stream buffers. The diameter limit prescription will minimize the impact to visuals. Retention in the unit is high to maintain habitat for Anan bears. There are about seven acres of non-wetland forest/forested wetlands complex in this unit.

Stand Management Objectives: Future stand to have several canopy layers and more than two age classes. Trees are being retained to meet the visual quality objective and to provide structure. Retain trees until next rotation. 40% retention. Harvest unit while leaving a mix of species.

Silvicultural Prescription: Helicopter with upper and lower diameter limit and reserve clumps.

Regeneration Method: Natural.

Possible Future Treatments: Release and pre-commercial thinning.

## RESOURCE CONCERNS & MITIGATION

### Water Quality/ Fisheries

Concern: Bear Creek (Class I) AFI flows east of unit. A Class II HC6 tributary to Canal Creek flows south of unit.

Mitigation: No timber harvest within 140 feet of outermost channel on Bear Creek. This includes no harvest within 100 horizontal feet of stream. No timber harvest within notch on Class II stream. This includes no harvest within 100 horizontal feet of stream.

### Soils

Concern: No concerns as planned.

Mitigation:

### Wildlife

Concern: Bear denning potential. Adjacent to estuary.

Mitigation: Close roads after logging with gates and closure order. Create 2-3 reserves within the unit that contain suitable denning trees (>40" DBH). Avoid removing large trees with cavities, downed logs or snags. On downed trees retain at least 15' of the butt log attached to the rootwad. Leave 6' stumps on potential den trees. Locate unit at least 1000' from beach.

### Anan Bears

Concern: Noise of helicopter yarding during denning and during tourist season.

Mitigation: Restrict timing of helicopter yarding during denning period. Restrict flights over Anan during the tourist season.

### Visuals

Concern: Appearance of unit from Bradfield Canal.

Mitigation: Retain trees in unit. Design unit with an irregular shaped boundary.

### Special Contract Concerns

Ensure stream buffers are protected.

# A -Unit Cards and Extra Alternative Maps

UNIT 47

ALTERNATIVE 1

23 ACRES



- Proposed Roads
- Class I Streams
- Class II Streams
- Class III Streams
- Class IV Streams
- Powerline

- Eagle Nest Tree
- Proposed cut units
- Adjacent proposed units
- TTRA Buffers
- 1/4 Mile Eagle Nest Timing Buffers

**E** Proposed LTF Sites

HC1,MM3,... Channel Types

## PRESCRIPTIONS

CC = Clearcut  
DD = Diameter Limits  
PP = Patch Cut

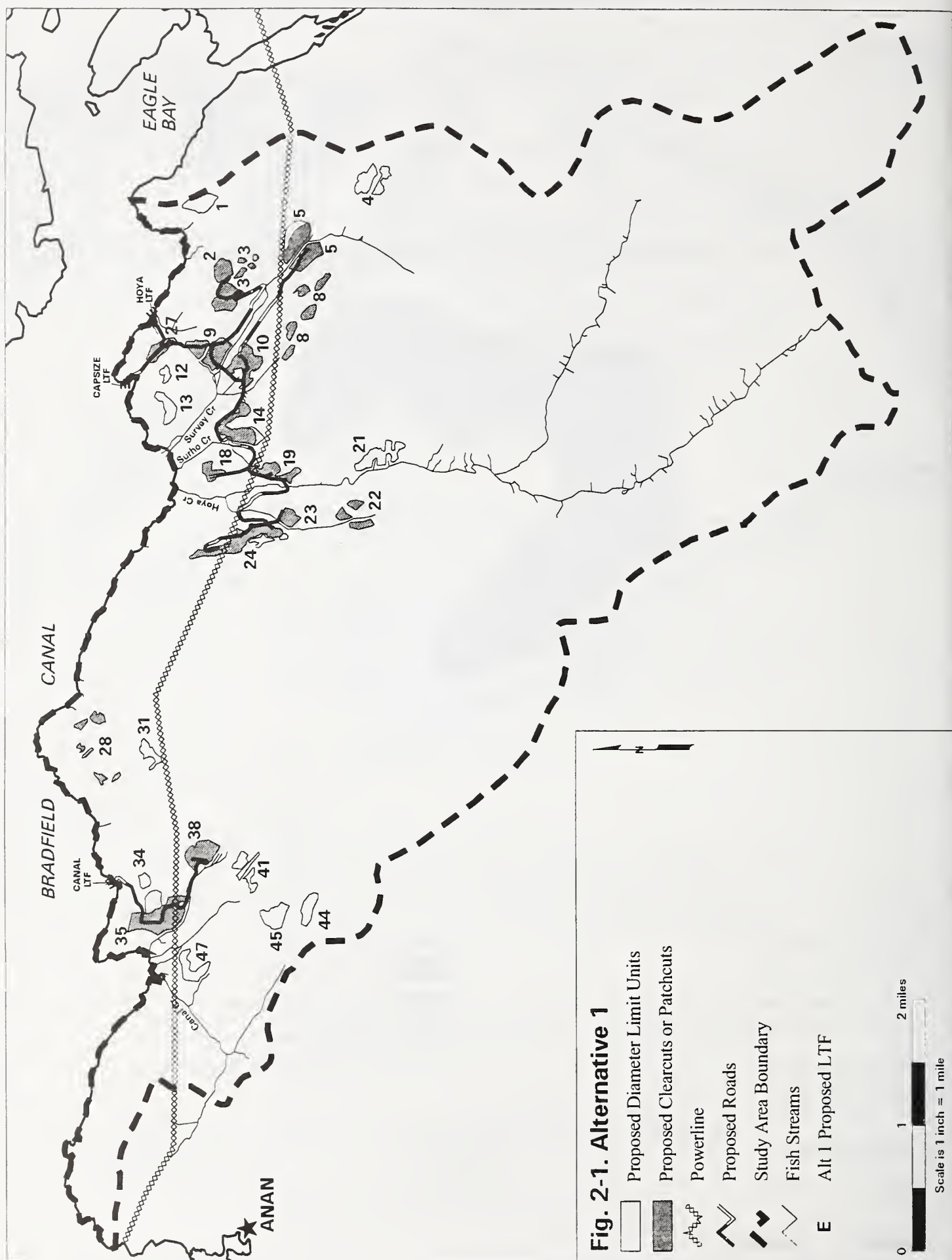
## HARVEST SYSTEMS

C = Cable  
H = Helicopter

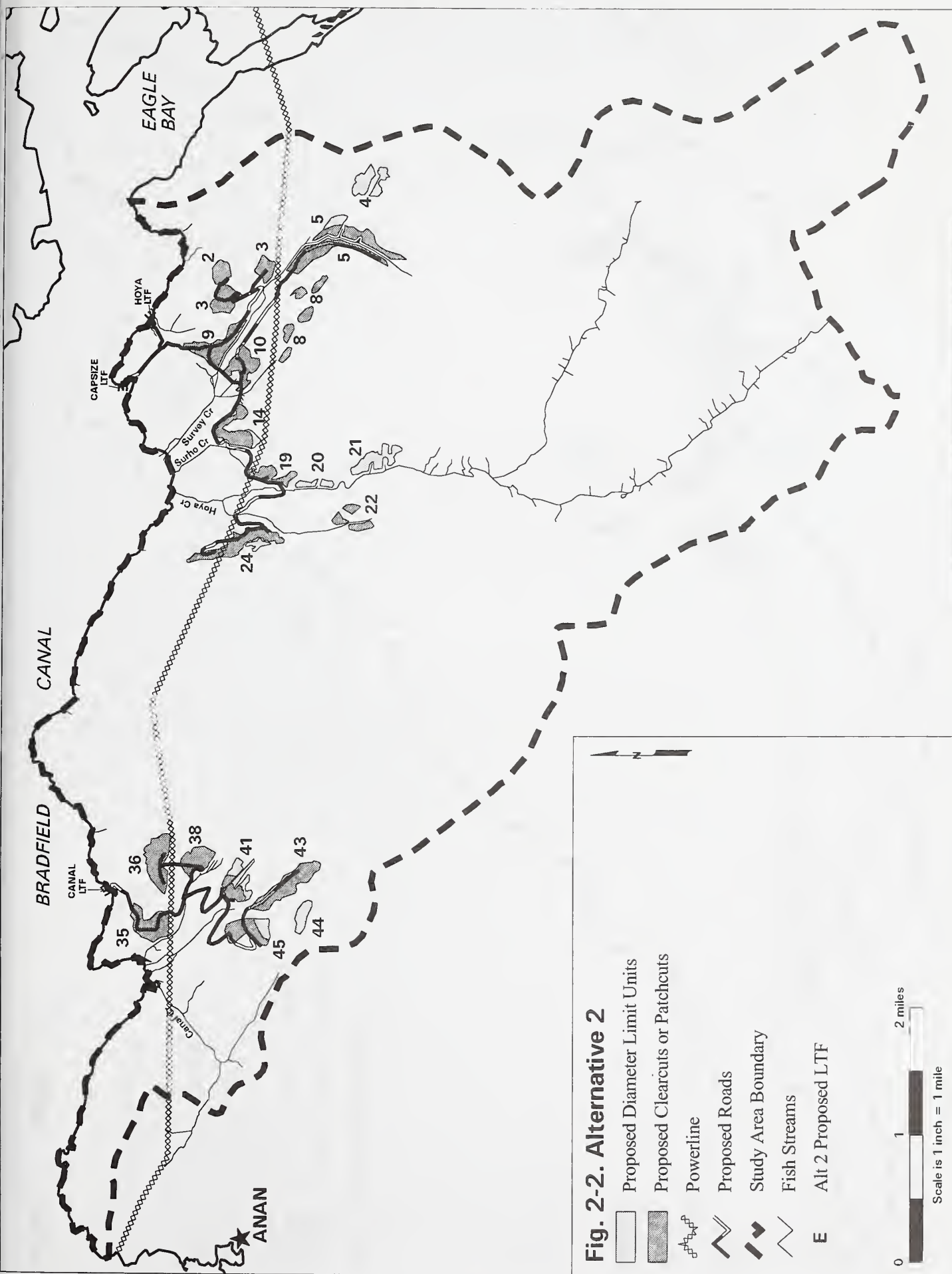
0 500 1000 feet

Scale is 1 inch = 0.09 miles

Last Updated: November 07, 1997



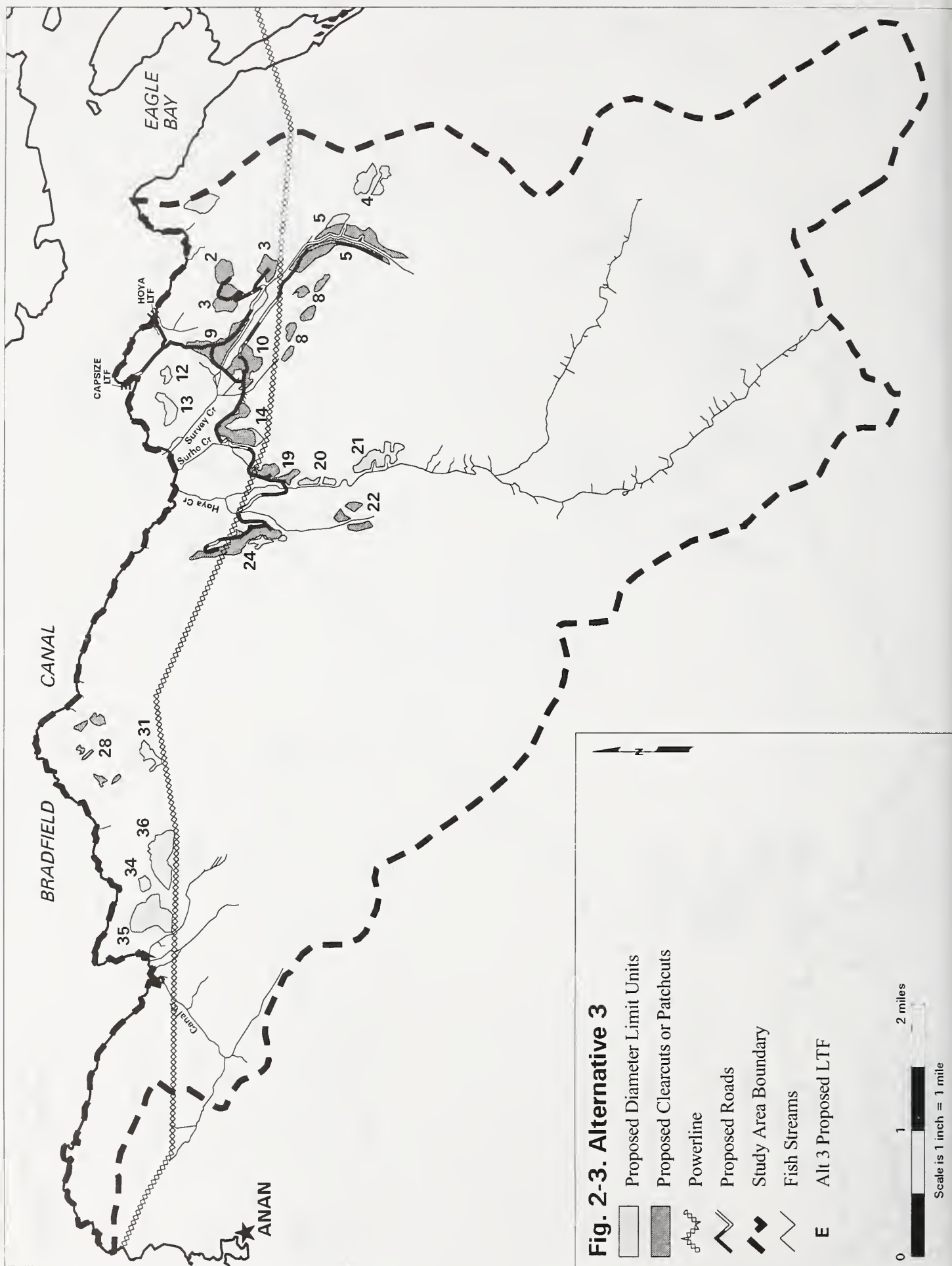


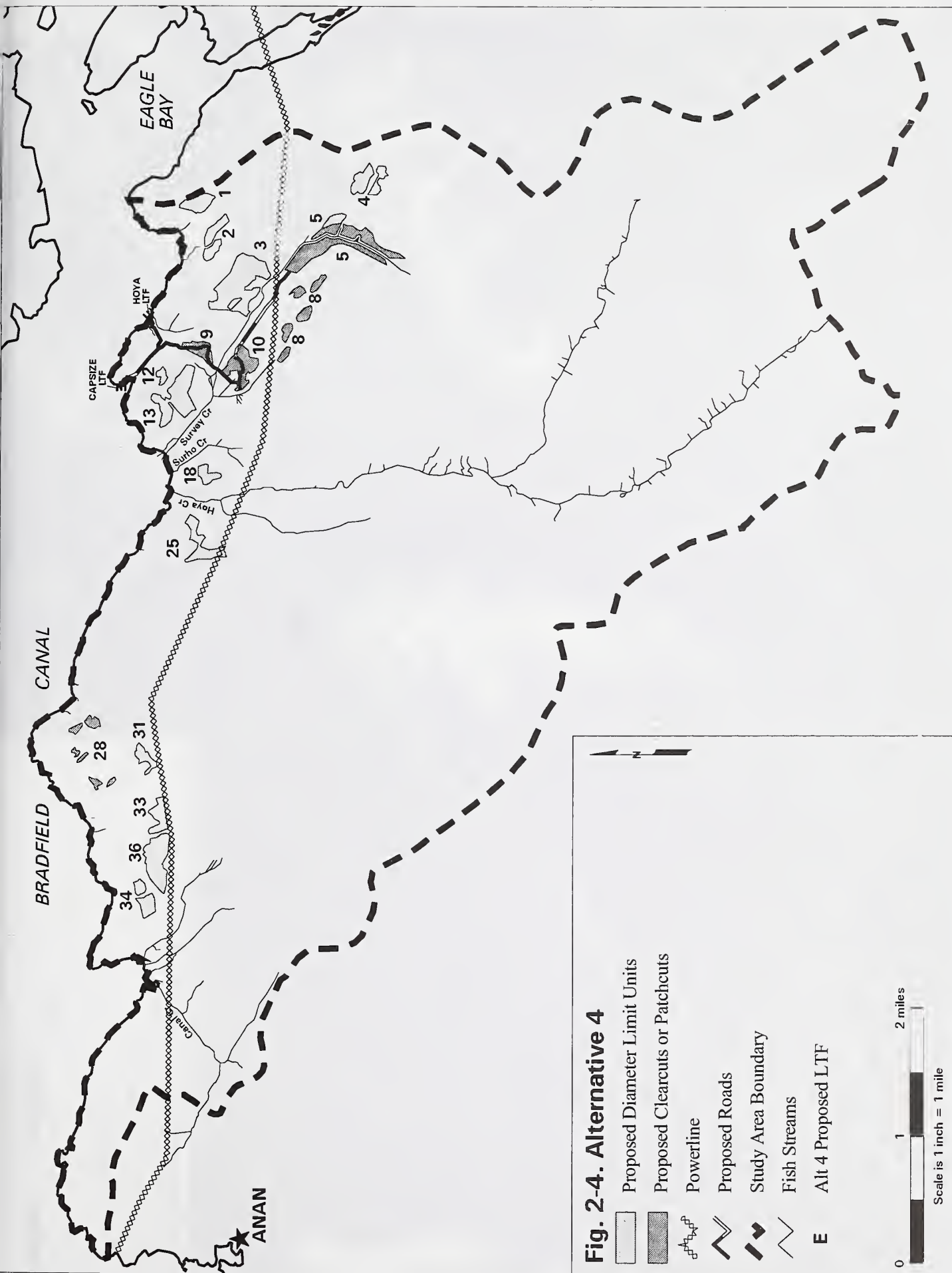


**Fig. 2-2. Alternative 2**

- Proposed Diameter Limit Units
- Proposed Clearcuts or Patchcuts
- Powerline
- Proposed Roads
- Study Area Boundary
- Fish Streams
- E Alt 2 Proposed LTF

0 1 2 miles  
Scale is 1 inch = 1 mile











# **Appendix B**

## **Road Cards**







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## B - Road Cards

### ROAD DESCRIPTION

**PROJECT NAME:** Canal Hoya **VCU:** 5210

**ROAD NUMBER:** 6950

**FUNCTIONAL CLASS:** Local **ENTRY CYCLE:** Intermittent

**LENGTH:** 3.1 mi. **TRAFFIC SERVICE LEVEL:** D **DESIGN SPEED:** 10 mph

**DESIGN VEHICLE:** Logtruck **CRITICAL VEHICLE:** Lowboy

**MAINTENANCE LEVELS: (ACTIVE SALE)** 3 **POST SALE:** 1 **HIGHWAY SAFETY ACT:** No

**INTENDED PURPOSE:** To provide access for cable and helicopter logging in the Canal VCU.

**TRAFFIC MANAGEMENT STRATEGY:** Maintain for administrative use. Two gates will be installed near the LTF to prevent non-administrative use.

**ROAD LOCATION:** The road begins at the Canal LTF site. This road is typical overlay construction although some endhaul may be required in short stretches due to nearness of creeks depending on the road design.

**WETLANDS:** Where practical the road went around wetlands but due to grades, horizontal alignment and increased length of roads some wetlands had to be crossed. BMP 12.5 applies to wetland road construction. Where terrain allows, overlay construction will be used, excavation will be avoided, and extra cross drains will be installed to avoid altering subsurface flow regimes.

**EROSION CONTROL:** An erosion control plan for road construction and maintenance will be developed according to standard project specifications (BMP 14.5). Specific design measures will address erosion control in the vicinity of streams on the approach to the LTF and stream crossings. All areas of organic or mineral soil exposed during construction shall be grass seeded (with native species if possible) and fertilized (BMP 12.17, 14.8 E1).

**ROCK PITS:** During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspended at quarries near potentially unstable sites where ground vibration may induce mass movement. No quarries have been located near streams. Rock pits will require site specific erosion control plans (BMP 14.18).

**FUTURE NEEDS:** Will be intermittently used for general forest administration.

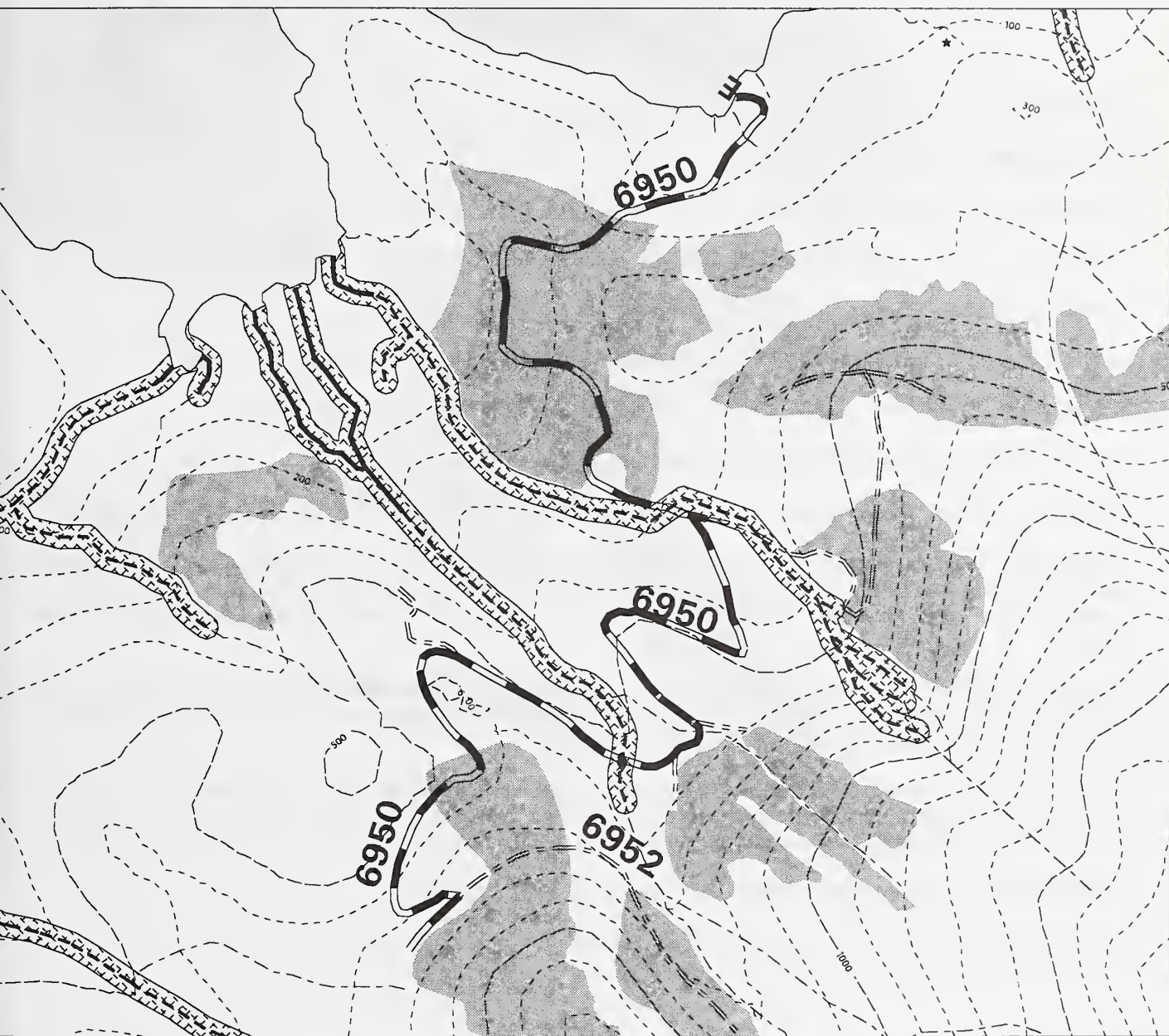
**STREAM CROSSINGS:** See road description photo for corresponding points on Road 6950. There are three Class II stream crossings: Cowboy Creek A, Cowboy Creek B, and Bear Creek A (also known as Hydro Site "CH6").

Cowboy Creek A: Stream Channel Type MM1, bankfull width 2.5 meters, incision depth 1 meter, gravel substrate, gradient 4%. Crossing site is at channel meander and may affect both riffle and pool habitat. Adjust alignment to maintain perpendicular crossing and avoid channel straightening. Maintain resident fish passage through drainage structure. There is about one mile (all tributaries considered) of resident fish habitat upstream of this site.




Cowboy Creek B: Stream Channel Type MM1, bankfull width 2 meters, incision depth 1 meter, gravel substrate, gradient 4%. Crossing site is in pool habitat. Maintain resident fish passage through drainage structure. There is about 0.75 miles (all tributaries considered) of resident fish habitat upstream of this site.

Bear Creek A (Hydro Site CH6): Stream Channel Type HC3, bankfull width 10 meters, incision depth 10 meters, boulder and cobble substrate, gradient 10%. Large pool just upstream of crossing site contains fish. Stream has large bedload and debris transport. A 65 foot bridge is planned.

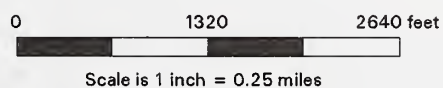
# ROAD NUMBER 6950



-  Proposed Road Segment
-  Adjacent Proposed Road Segments
-  Class 1 Streams
-  Class 2 Streams
-  Class 3 Streams
-  Eagle Nest Tree
-  Proposed Log Transfer Facility
-  Proposed Major Stream Crossing

-  Proposed cut units
-  TTRA Buffers
-  Saltwater and Lakes

Last Updated: November 07, 1997





## B - Road Cards

### ROAD DESCRIPTION

**PROJECT NAME:** Canal Hoya **VCU:** 5210

**ROAD NUMBER:** 6952

**FUNCTIONAL CLASS:** Local **ENTRY CYCLE:** Intermittent

**LENGTH:** 1 mi. **TRAFFIC SERVICE LEVEL:** D **DESIGN SPEED:** 10 mph

**DESIGN VEHICLE:** Log Truck **CRITICAL VEHICLE:** Lowboy

**MAINTENANCE LEVELS: (ACTIVE SALE)** 3 **POST SALE:** 1 **HIGHWAY SAFETY ACT:** No

**INTENDED PURPOSE:** To provide access for cable and helicopter logging in Units 43, 44, and 45.

**TRAFFIC MANAGEMENT STRATEGY:** Maintain for administrative use.

**ROAD LOCATION:** The road begins at the end of Road 6950 in Unit 45. This road is typical overlay construction.

**WETLANDS:** Where practical the road went around wetlands but due to grades, horizontal alignment and increased length of roads some wetlands had to be crossed. BMP 12.5 applies to road construction on wetlands. Where terrain allows, overlay construction will be used, excavation will be avoided, and extra cross drains will be installed to avoid altering subsurface flow regimes.

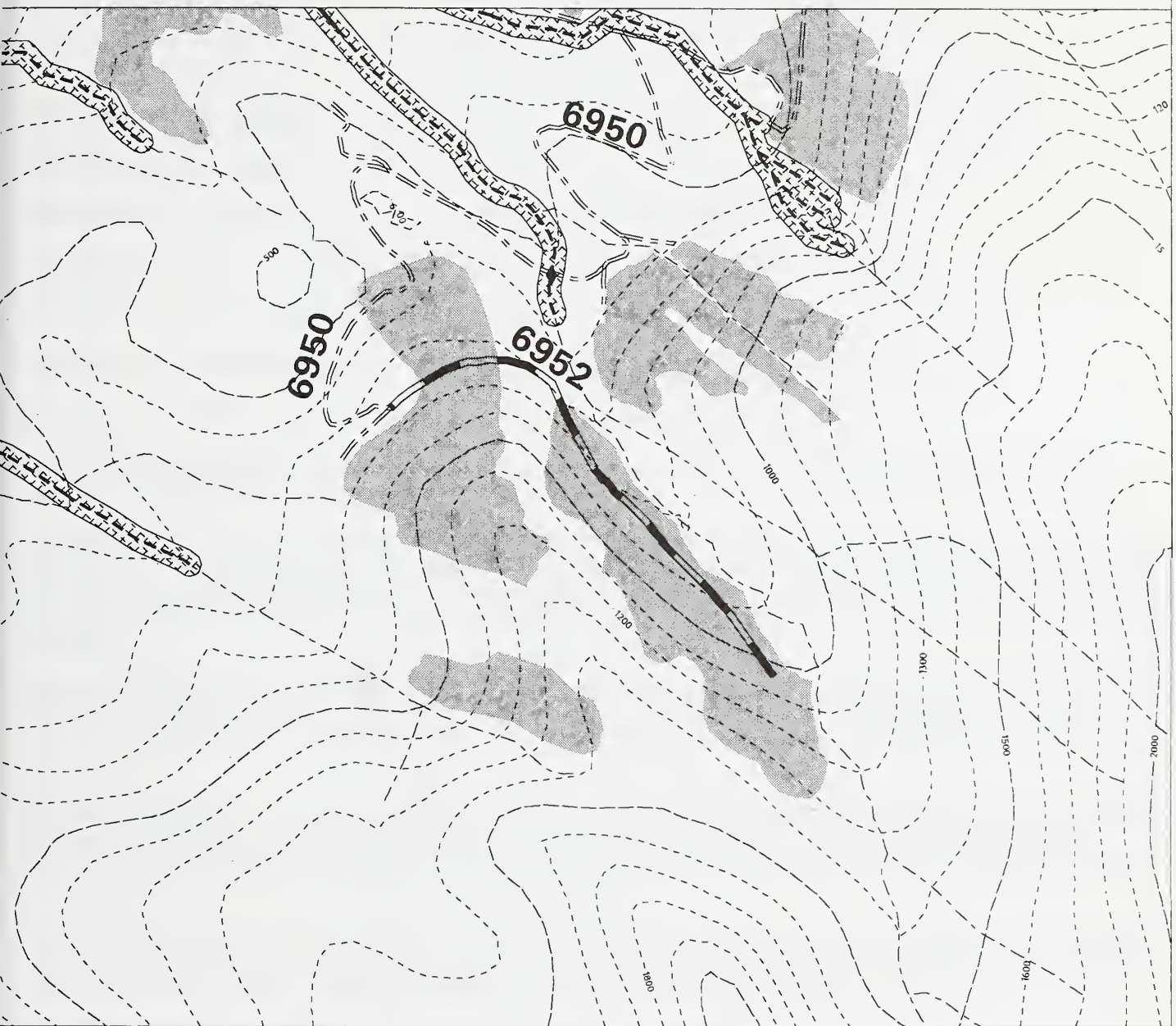
**EROSION CONTROL:** An erosion control plan for road construction and maintenance will be developed according to standard project specifications (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded (with native species if possible) and fertilized (BMP 12.17, 14.8 E1).












**ROCK PITS:** During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspended at quarries near potentially unstable sites where ground vibration may induce mass movement. No quarries have been located near streams. Rock pits will require site specific erosion control plans (BMP 14.18).

**FUTURE NEEDS:** Will be intermittently used for general forest administration.

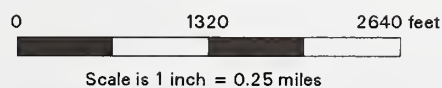
**STREAM CROSSINGS:** There are no major stream crossings.

# ROAD NUMBER 6952



- |   |                                 |   |                     |
|---|---------------------------------|---|---------------------|
|  | Proposed Road Segment           |  | Proposed cut units  |
|  | Adjacent Proposed Road Segments |  | TTRA Buffers        |
|  | Class 1 Streams                 |  | Saltwater and Lakes |
|  | Class 2 Streams                 |   |                     |
|  | Class 3 Streams                 |   |                     |
|  | Eagle Nest Tree                 |   |                     |
|  | Proposed Log Transfer Facility  |   |                     |
|  | Proposed Major Stream Crossing  |   |                     |

Last Updated: November 07, 1997



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## B - Road Cards

### ROAD DESCRIPTION

**PROJECT NAME:** Canal Hoya **VCU:** 5200

**ROAD NUMBER:** 6960

**FUNCTIONAL CLASS:** Local **ENTRY CYCLE:** Intermittent

**LENGTH:** 3.30 mi. **TRAFFIC SERVICE LEVEL:** D **DESIGN SPEED:** 10 m.p.h.

**DESIGN VEHICLE:** Log Truck **CRITICAL VEHICLE:** Lowboy

**MAINTENANCE LEVELS:** (ACTIVE SALE) 3 **POST SALE:** 1 **HIGHWAY SAFETY ACT:** No

**INTENDED PURPOSE:** To provide access for cable and helicopter logging in Hoya VCU.

**TRAFFIC MANAGEMENT STRATEGY:** Maintain for administrative use. Two gates will be installed near the LTF to prevent non-administrative use.

**ROAD LOCATION:** The road begins at either Capsize Cove LTF (Road 69601) or Hoya LTF (Road 69602). Both Roads 69601 and 69602 will require design to control runoff adjacent to streams. This road is mostly typical overlay construction. There will be areas of full benching and some of these will require endhaul. Alignment near West Fork Survey Creek may require adjustment to accommodate crossing of overflow channels and small Class II streams. Alignment near Surho Creek tributaries will require endhaul.

**WETLANDS:** Where practical the road went around wetlands but due to grades, horizontal alignment and increased length of roads some wetlands had to be crossed. BMP 12.5 applies to road construction on wetlands. Where terrain allows, overlay construction will be used, excavation will be avoided, and extra cross drains will be installed to avoid altering subsurface flow regimes.

**EROSION CONTROL:** An erosion control plan for road construction and maintenance will be developed according to standard projects specifications (BMP 14.5). Specific design measures will address erosion control in the vicinity of streams on the approach to the LTF and stream crossings. All areas of organic or mineral soil exposed during construction shall be grass seeded (with native species if possible) and fertilized (BMP 12.17, 14.8 E1).

**ROCK PITS:** During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspended at quarries near potentially unstable sites where ground vibration may induce mass movement. One quarry has been located near Class II Surho Creek tributary. Rock pits will require site specific erosion control plans (BMP 14.18).

**FUTURE NEEDS:** Will be intermittently used for general forest administration.

**TIMING RESTRICTIONS:** Instream construction activities on the East Fork and West Fork of Survey Creek will be restricted to the period between June 1 and August 1 based on the likelihood of pink salmon, chum salmon, or coho salmon eggs in gravel immediately downstream of these proposed road crossings during the rest of the year (BMP 14.6).

**STREAM CROSSINGS:** See road description photo for corresponding points on Road 6960. There are five major fish stream crossings: East Fork Survey Creek (Hydro Site H2), West Fork Survey Creek (Hydro Site H3), Mainstem Hoya Creek (Hydro Site H4), West Fork Hoya Creek A (Hydro Site H6) and West Fork Hoya Creek B (temporary road). Also four Class II stream crossings tributary to the West Fork Survey Creek and two possible Class II crossings tributary to Surho Creek.

East Fork Survey Creek: Stream Channel Type MC2 (transition to FP3). Bankfull width 15 meters, incision depth 1 meter, cobble and gravel substrate, gradient 3%. Crossing is at riffle habitat just upstream of transition into floodplain stream with sidechannels. Anadromous fish observed at crossing site. Bridge (60 feet plus) is planned.

## B - Road Cards

West Fork Survey Creek: Stream Channel Type is HC2 (transition to MM1). Main channel bankfull width 7 meters, incision depth 1 meter, boulder and cobble substrate, gradient 10%. A 3-5 meter wide (recently active) overflow channel initiates upstream of the crossing site and flows west of main channel. Crossing is at steep riffle habitat just upstream of transition into lower gradient anadromous fish habitat. Cutthroat trout observed at crossing site. Maintain resident fish passage (0.5 miles habitat upstream of crossing site). Concern for large bedload and debris transport at this site. Structure design must account for overflow channel as well as main channel. Road crosses four tributaries immediately west of main channel crossing. All are Channel Type MM1, bankfull width 1 meter, incision depth <1 meter, cobble substrate, gradient 2-6%. All contain cutthroat trout, though upstream habitat ends within 100-200 feet of each crossing site.

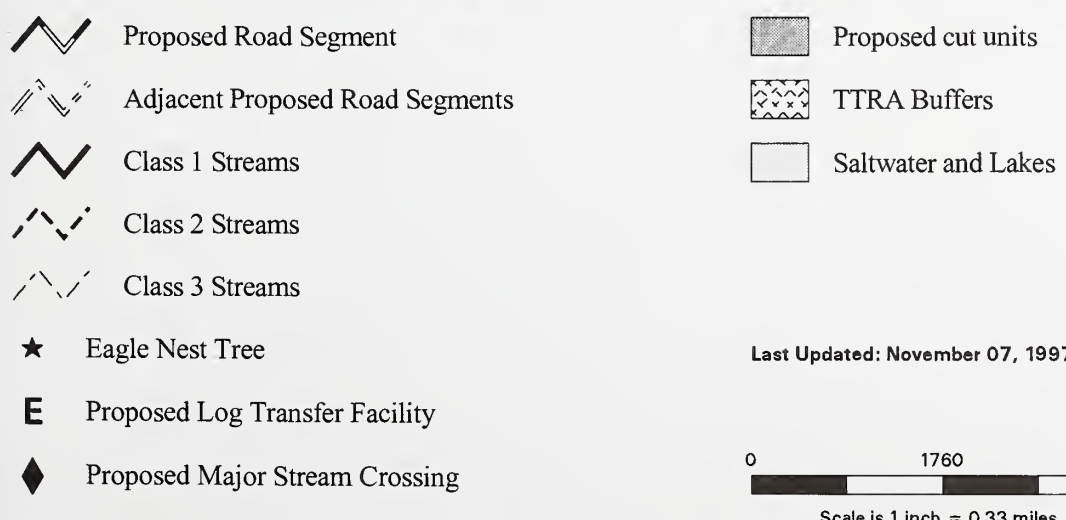
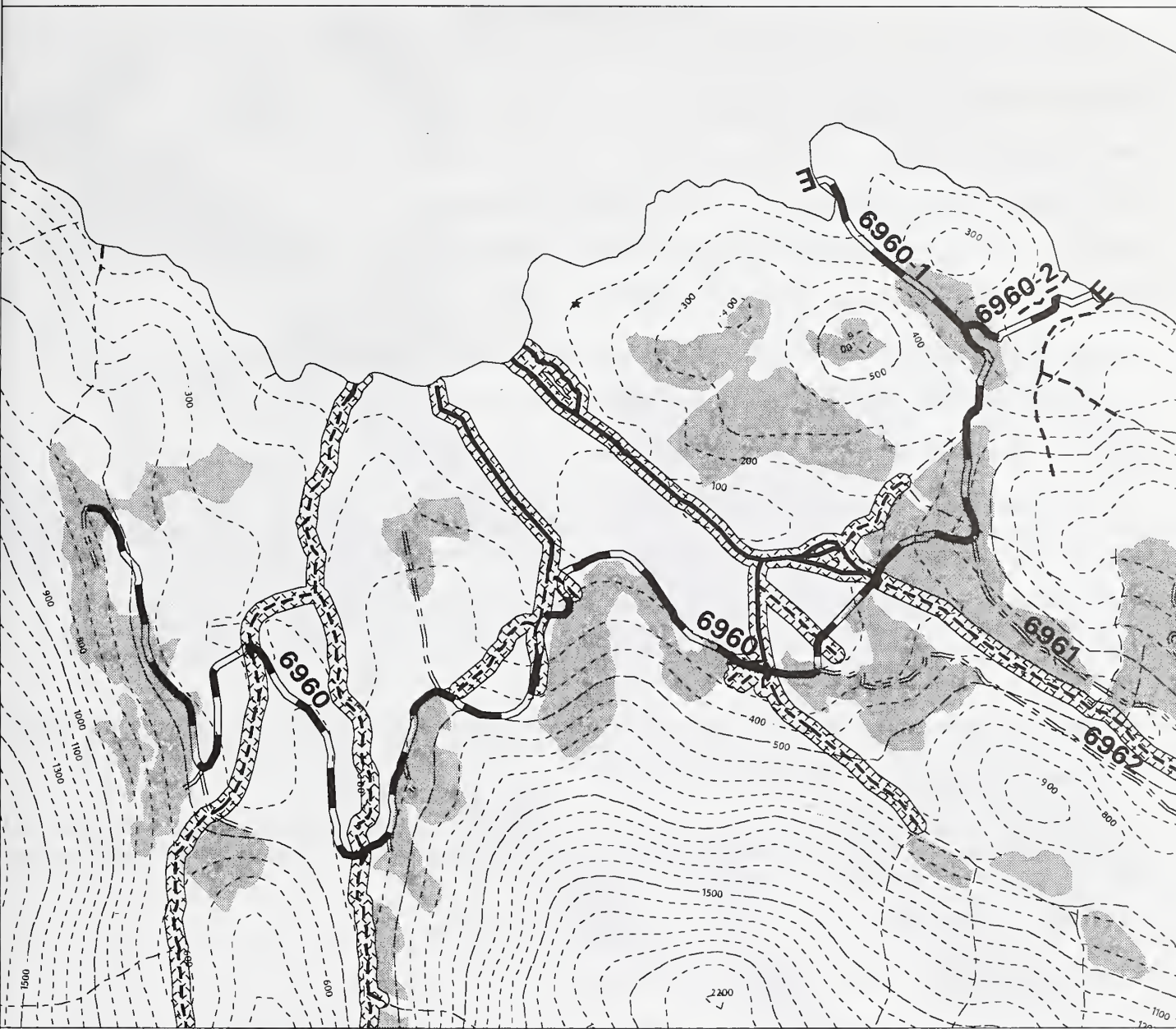
Two Class II crossings tributary to Surho Creek: East tributary stream Channel Type is MM1. Bankfull width is <1 meter, incision depth <1 meter, gravel substrate, gradient 3%. Resident fish observed downstream of crossing, habitat ends about 100 feet upstream of crossing. West tributary stream Channel Type is HC5. Bankfull width is <1 meter, incision depth 3 meters, cobble and boulder substrate, gradient 15%. Resident fish observed downstream of crossing, habitat ends about 100 feet upstream of crossing.

Mainstem Hoya Creek: Stream Channel Type is MC2. Bankfull width is 12 meters, incision depth 5 meters, cobble and boulder substrate, gradient 8%. Resident fish observed upstream of crossing. Crossing is in between impassable bedrock falls. Concern for large debris and bedload transport at this site.

East Fork Hoya Creek A: Stream Channel Type is MM1. Bankfull width is 7 meters, incision depth 1 meter, cobble and gravel substrate, gradient 3%. Resident fish observed at crossing. Maintain fish passage (over one mile of habitat upstream).

East Fork Hoya Creek B: Stream Channel Type is MM1. Crossing similar to downstream crossing. This is a temporary road accessing Unit 23 (Alternative 1 only) This site is a temporary crossing suitable for log stringer bridge which would be removed upon completion of logging activities. Maintain fish passage (0.7 miles habitat upstream).

# ROAD NUMBER 6960





## B - Road Cards

### ROAD DESCRIPTION

**PROJECT NAME:** Canal Hoya **VCU:** 5200

**ROAD NUMBER:** 6961

**FUNCTIONAL CLASS:** Local **ENTRY CYCLE:** Intermittent

**LENGTH:** 0.9 mi. **TRAFFIC SERVICE LEVEL:** D **DESIGN SPEED:** 10 mph

**DESIGN VEHICLE:** Log Truck **CRITICAL VEHICLE:** Lowboy

**MAINTENANCE LEVELS: (ACTIVE SALE)** 3 **POST SALE:** 1 **HIGHWAY SAFETY ACT:** No

**INTENDED PURPOSE:** To provide access for cable and helicopter logging in Units 2, 3, and 9.

**TRAFFIC MANAGEMENT STRATEGY:** Maintain for administrative use.

**ROAD LOCATION:** The road begins at road 6960 at mile post 0.68 in Unit 9. This road is typical overlay construction to mile post 0.8. After mile post 0.8 (in the vicinity of the switchback near Unit 3) there are several sections that will require full bench rock cut. Due to the length of steep side slopes or proximity of streams some endhaul will be required.

**WETLANDS:** Where practical the road went around wetlands but due to grades, horizontal alignment and increased length of roads some wetlands had to be crossed. BMP 12.5 applies to road construction on wetlands. Where terrain allows, overlay construction will be used, excavation will be avoided, and extra cross drains will be installed to avoid altering subsurface flow regimes.

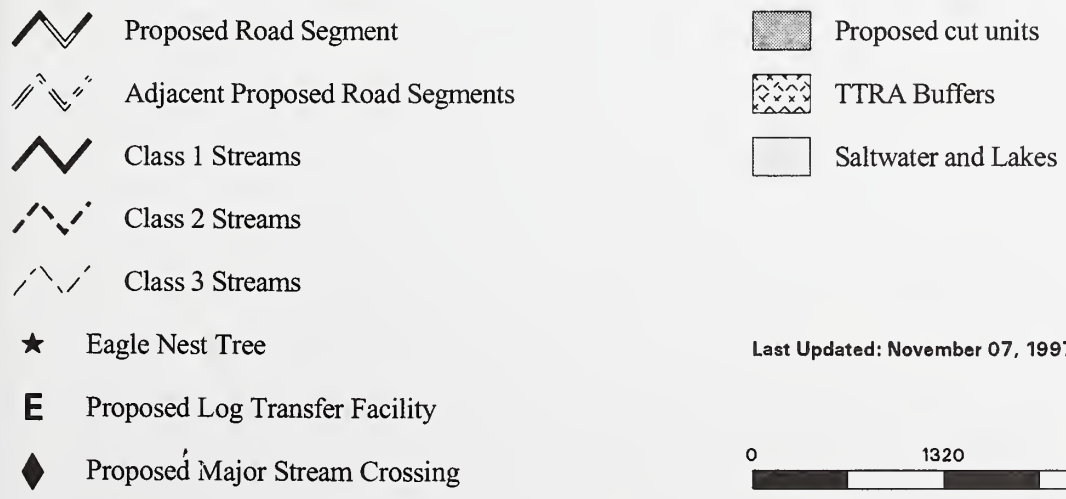
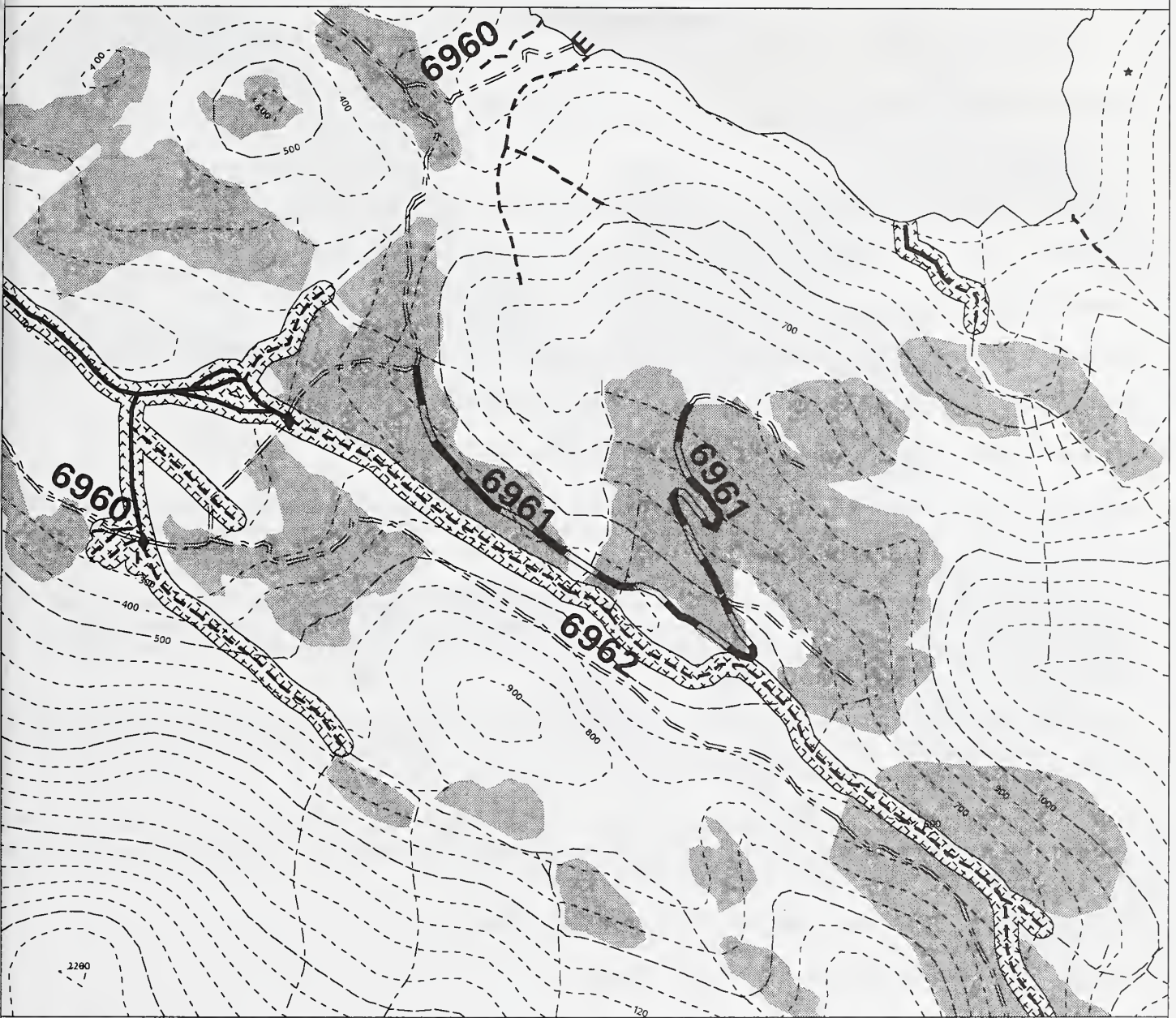
**EROSION CONTROL:** An erosion control plan for road construction and maintenance will be developed according to standard project specifications (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded (with native species if possible) and fertilized (BMP 12.17, 14.8 E1).

**ROCK PITS:** During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspended at quarries near potentially unstable sites where ground vibration may induce mass movement. No quarries have been located near streams. Rock pits will require site specific erosion control plans (BMP 14.18).

**FUTURE NEEDS:** Will be intermittently used for general forest administration.

**STREAM CROSSINGS:** There are no major stream crossings:

# ROAD NUMBER 6961





## B - Road Cards

### ROAD DESCRIPTION

**PROJECT NAME:** Canal Hoya **VCU:** 5200

**ROAD NUMBER:** 6962

**FUNCTIONAL CLASS:** Local **ENTRY CYCLE:** Intermittent

**LENGTH:** 1.9 mi. **TRAFFIC SERVICE LEVEL:** D **DESIGN SPEED:** 10 mph

**DESIGN VEHICLE:** Log Truck **CRITICAL VEHICLE:** Lowboy

**MAINTENANCE LEVELS:** (ACTIVE SALE) 3 **POST SALE:** 1 **HIGHWAY SAFETY ACT:** No

**INTENDED PURPOSE:** To provide access for cable and helicopter logging in Units 4, 5, 8, and 10.

**TRAFFIC MANAGEMENT STRATEGY:** Maintain for administrative use.

**ROAD LOCATION:** The road begins at road 6960 at mile post 1.05. The first 0.6 mile of this road is a series of full bench rock cuts followed by a filling through a notch then staying on top of a ridge beyond M.P. 0.6 the road is typical overlay construction. All road beyond this point will be temporary.

**WETLANDS:** Where practical the road went around wetlands but due to grades, horizontal alignment and increased length of roads some wetlands had to be crossed. BMP 12.5 applies to road construction on wetlands. Where terrain allows, overlay construction will be used, excavation will be avoided, and extra cross drains will be installed to avoid altering subsurface flow regimes.

**EROSION CONTROL:** An erosion control plan for road construction and maintenance will be developed according to standard project specifications (BMP 14.5). All areas of organic or mineral soil exposed during construction shall be grass seeded (with native species if possible) and fertilized (BMP 12.17, 14.8 E1)

**ROCK PITS:** During periods of high rainfall (as defined in current regional specifications) blasting operations will be suspended at quarries near potentially unstable sites where ground vibration may induce mass movement. No quarries have been located near streams. Rock pits will require site specific erosion control plans (BMP 14.18).






**FUTURE NEEDS:** Will be intermittently used for general forest administration

**STREAM CROSSINGS:** There are no major stream crossings:



# ROAD NUMBER 6962



-  Proposed Road Segment
-  Adjacent Proposed Road Segments
-  Class 1 Streams
-  Class 2 Streams
-  Class 3 Streams

★ Eagle Nest Tree

E Proposed Log Transfer Facility

◆ Proposed Major Stream Crossing

 Proposed cut units

 TTRA Buffers

 Saltwater and Lakes

Last Updated: November 07, 1997

0 1320 2640 feet

Scale is 1 inch = 0.25 miles



# **Appendix C**

## **Monitoring and Improvement Projects**







# Appendix C

## Monitoring and Improvement Projects

### Monitoring Plan

#### Log Transfer Facility

**Objective:** Determine permit compliance according to permit requirements.

**Method:** SCUBA divers run transects and record depth and areal extent of bark accumulation once before and annually during logging activities.

**Action:** Notify EPA if bark deposition encompasses 100% coverage of an area one acre or larger in which the depth of bark exceeds ten centimeters at any point in that area. EPA may require removal of bark.

**Cost:** \$1000

#### Best Management Practice Implementation

**Objective:** Evaluate application of BMPs for water quality and fish habitat protection.

**Method:** Follow Alaska Region BMP implementation monitoring protocols. Randomly select completed roads and units.

**Action:** If protection is inadequate, apply corrective measures. If protection measures are inadequate or unsuitable, modify future recommendations.

**Cost:** \$1000

#### Best Management Practice Effectiveness

**Objective:** Address priorities indicated in Tongass National Forest effectiveness monitoring strategy. Monitoring sites may or may not be selected within the Canal Hoya Project Area.

**Action:** If protection is inadequate, modify BMP.

**Cost:** Variable

## **C - Monitoring and Improvement Projects**

### **Predicted Timber Volume**

**Objective:** Determine if harvest prescriptions achieved predicted timber volume.

**Method:** Prior to harvest, compare cruise volumes of various units with anticipated volumes based on prescription assumptions. During harvest, work with timber purchaser to obtain volume information if lump sum sale. If scaled sale, check harvest records as units are logged. District monitoring team would be responsible for implementing.

**Action:** Refine estimates for future sales.

**Cost:** \$2000

### **Regeneration**

**Objective:** To determine if there is adequate natural stocking within each unit four years after harvest.

**Method:** Field exams of each unit.

**Action:** If adequate sticking is not present in any harvest unit, it will be planted to bring stocking up to at least 300 trees per acre.

**Cost:** \$15,000 - \$35,000 depending on the alternative selected.

### **Prescription Accomplishment**

**Objective:** To determine if timber sale prescriptions met the resource objectives after harvest. Did the leave trees release? How are leave trees affecting the growth and health of regeneration? Were adequate bear den trees left in the units? Are the reserves in harvested units being used by wildlife?

**Method:** IDT members will do a field review of selected units and discuss the results.

**Action:** Use the results to refine future prescriptions.

**Cost:** \$5000

### **Blowdown**

**Objective:** To determine if there is any blowdown in reserve clumps, partial harvest units, and unit edges.

**Method:** Aerial flights and ground reconnaissance.

**Action:** Use the results to refine future prescriptions.

**Cost:** \$1000

### **Scenic Resources**

**Objective:** Determine if harvest prescriptions were implemented and effective in meeting the visual quality objectives. Determine how close resulting harvest is to the desired condition.

**Method:** Before and after photos will be evaluated and site inspections will be made two years following harvest.

**Action:** Produce a chart showing the number of acres treated, the prescription and the result.

**Cost:** \$2000

### **Marine Slash**

**Objective:** To determine if the amount of slash escaping from the processing barge poses a hazard to navigation or creates problems for sport and commercial fishing.

**Method:** Have the timber sale administrators and operators watch for floating slash and require the operator to retrieve it. Request comments from fishermen and boat operators in the area. Use an underwater camera to determine the amount of debris on the ocean floor.

**Action:** The contract will require slash containment and pick-up by the operator.

**Cost:** \$2000



## C - Monitoring and Improvement Projects

### Wildlife Harvest

**Objective:** Determine if changes in harvest of big game and furbearers are consistent with predictions in the EIS and subsistence report. Harvest rates are important in assessing whether the supply of game is adequate to meet demand by subsistence hunters and trappers (martens), to ensure viability of certain species (wolves), and to assess effects on bears that may also use the Anan Wildlife Viewing Area.

**Method:** Annually review ADFG harvest data to determine subsistence versus non-subsistence harvest and changes in the rate of harvest over time. If a marked increase or decrease in harvest is observed, consult with ADFG to determine the cause.

**Action:** If non-subsistence harvest or increasing total harvest trends indicate that future populations may be insufficient to meet subsistence demand, assess hunting regulations and travel management (road access) to determine needed changes. This monitoring is also an essential part of the adaptive management strategy for road construction alternatives in future entries.

**Cost:** \$350 per year

### Road Closure Effectiveness

**Objective:** To determine if gates are effective in eliminating motorized vehicle traffic and to determine the extent of administrative use and foot travel occurring on the roads during various seasons. This will give us an idea of the amount of disturbance and hunting that is occurring in the Project Area.

**Method:** Traffic counters (pressure activated and/or motion detection), track plates or cameras will be used.

**Action:** If unauthorized vehicle use occurs, additional barriers will be installed. If administrative use is heavy, restrictions on the season of use will be implemented. If foot traffic during hunting seasons is heavy, road construction alternatives in future entries should be adjusted accordingly. Gates that are damaged or not functioning will be replaced or improved.

**Cost:** \$2000 per year

### Raptor Nests

**Objective:** To determine if protection measures are adequate to promote continued use of raptor nests.

**Method:** The sharp-shinned hawk nest found in the Hoya drainage will be visited annually for not less than two years following harvest to determine if the nest remains active.

**Action:** If the nest is inactive for two years, protection measures may be removed; however, the size of the buffer for nests located in the future may need to be increased to promote continued use of the nest.

**Cost:** \$300 annually

### Anan Bears

**Objective:** To assess changes in the Anan bear population.

**Method:** Compare information on bear numbers, sex and age composition that is annually gathered at the Anan Wildlife Viewing Area with bear harvest data for the Canal Hoya area.

**Action:** If significant increases in bear harvest levels correspond with changes in the population or age/sex composition of the bears at Anan, assess hunting regulations and travel management for the Canal Hoya area with ADFG. Modify the design and location of future timber sales if appropriate.

**Cost:** \$2000 annually (as part of the Anan monitoring program)

## Sale Area Improvement

**Tree planting** - Units that are not adequately stocked within 5 years after harvest will be planted to increase stocking. Units may also be planted to increase the species diversity of Sitka spruce. This project complies with Forest Service K-V Handbook direction (FSH 2409.19) and may be listed in the Canal Hoya Sale Area Improvement Plan.



# **Appendix D**

## **LTF Site Selection, Design, and Marine Effects**







# Appendix D

## LTF Site Selection, Design, and Marine Effects

### Log Transfer Facility

Log transfer facilities (LTFs) are necessary to transfer logs from a ground-based transport system of roads and trucks to a water-based transport system of rafts, barges, and tugboats. The following guidelines are taken from Appendix G of the Revised Forest Plan (USDA Forest Service, 1997). They were developed by the Alaska Timber Task Force Log Transfer Facility Guidelines Technical Subcommittee in 1985. The guidelines identify physical characteristics necessary for safe and efficient log transport as well as minimum requirements for mitigation of water quality and aquatic habitat effects. We consider all of the guidelines and develop LTFs which represent the best mix: allowing activities to proceed while meeting all applicable statutory and regulatory requirements. The LTFs undergo a complex and rigorous permitting process involving multiple federal and state agencies. The information contained in this appendix is intended to facilitate the permitting process and provide an opportunity for the EIS reader to comment on Canal Hoya LTF location, construction, operation, and monitoring.

Early in the planning process, we identified four potential LTF sites for the Canal Hoya Project Area. In 1997, a fifth site was identified to respond to project scoping concerns associated with Capsize Cove. Sites 2, 4 and 5, which have the most potential for development, are shown on Figure D-1 and have been named as follows:

- Site 1 - Canal Bay
- Site 2 - Canal
- Site 3 - Hoya Bay
- Site 4 - Capsize Cove
- Site 5 - Hoya

Surveys were initially conducted in 1984. US Fish and Wildlife Service personnel conducted SCUBA surveys at Canal Bay, Canal, and Capsize Cove in 1996, and at Hoya in 1997 (USFWS unpublished LTF field investigation reports, 1996 and 1997). Canal Bay was dropped in accordance with their recommendations. It does not meet siting guidelines related to site productivity (S6) and sensitive habitats (S7). Responses to project scoping also expressed strong opposition to this site from commercial fishermen and guides. Hoya Bay was dropped for similar reasons. It is near Hoya Creek and would have required an access road crossing Hoya Creek near the estuary.

## D - LTF Site Selection, Design, and Marine Effects

Three sites remain proposed for this project. At most, two would be developed: the Canal site for the Canal VCU road system, and either the Capsize Cove or Hoya site for the Hoya VCU road system. Site specific information pertaining to the guidelines for these proposed LTFs follows.

### Siting Guidelines

*S1. Proximity to Rearing and Spawning Areas: Avoid sites within 300 feet of the mouth of anadromous fish streams, or in areas known to be important for fish spawning or rearing.*

None of the sites is near important spawning or rearing areas. Canal is about 3200 feet shoreline distance west of the nearest anadromous fish stream (Flying V Creek). Capsize Cove is about 5300 feet shoreline distance east of the nearest anadromous fish stream (Survey Creek). Hoya is about 3300 feet shoreline distance west of the nearest anadromous fish stream (Hardrock Creek). Hoya is the only site in close proximity to resident fish streams. This site is bounded on both sides by small streams (less than 2 m width) containing cutthroat trout. Both streams were surveyed by electroshocker in 1994 and 1997. The west stream has a steep mouth at salt water which creates a natural barrier to fish migration at all tides. The east stream mouth is less steep and may be accessible by salmon at high tide, but no salmon have been observed there. Erosion control and sediment detention will be prominent design features of the LTF and access road at Hoya to ensure the protection and maintenance of fish habitat in these streams.

Despite its proximity to fish streams, Hoya may be a more favorable site than Capsize Cove from a water quality perspective. The proposed access road to the Hoya site is situated on a ridge between the two streams, therefore providing opportunity for a crowned road bed with frequent drainage to vegetated filtering areas between the road and the streams. The access road to Capsize Cove must pass through a wet draw comprising the headwaters of a small steep stream draining into the cove. The terrain allows little room for sediment control between the road and this stream and the road design will need to incorporate sediment detention structures requiring frequent maintenance to minimize sediment transport into Capsize Cove.

*S2. Protected Locations: Choose sites in weather-protected waters with bottoms suitable for anchoring and with at least 20 acres for temporary log storage and log booming.*

Protection from wind and high seas is limited throughout the Bradfield Canal. All three sites are somewhat exposed to westerly winds, which are expected to be of most concern during the normal operating season. Canal is also exposed to northerly winds out of Blake Passage and Hoya is exposed to northeasterly winds out of the Bradfield River.

Capsize Cove is the most protected site; and may be one of the most protected bights on the south side of the Bradfield Canal. For this reason, it is used as an anchorage for commercial and charter fishing boats and the USFS floating field camp. Concerns raised during scoping regarding conflicts between safe anchorage and logging operations triggered the consideration of Hoya as an alternate site for the Hoya VCU's road system.

The design of the facilities and the log booming and rafting areas will consider site exposure. Design of the Capsize Cove LTF (if developed) would consider the long-term integrity of the site as a safe anchorage.

The protected rafting area at Capsize Cove is probably less than five acres. It could be compared to the size of the existing LTF and rafting area at Deep Bay on Zarembo Island.

*S3. Upland Facility Requirements: Choose sites with proximity to at least five acres of relatively flat uplands. The LTF should provide at least 60 linear feet of operating face along the water.*

Canal is within 1000 feet of its proposed sort yard and could accommodate a small work and storage area at the top of the access grade into the LTF. This sort yard will be within the 1000 foot beach fringe. Topography at the other two sites would probably not accommodate a waterfront storage and work area. Only truck unloading and turn-around would be possible. Capsize Cove and Hoya are within 2000 feet of the same proposed sort yard. This sort yard is outside of the 1000 foot beach fringe buffer. The size of the sort yards will be limited to about 2 acres. None of the LTF or sort yard sites could accommodate log storage areas of sufficient size to stockpile logs for barge-only operations.



## D - LTF Site Selection, Design, and Marine Effects

All sites will require at least 70 feet of tree clearing at the high water line for passage of log bundles. The actual operating face of the LTF structure may be narrower, depending on the design. There is adequate room at all sites for 60 feet of operating face along the water. However, visual mitigation measures incorporated into the LTF designs limit the operating face at any site, and resident fish streams adjacent to Hoya limit the length of its fill structure.

*S4. Safe Access to a Facility from the Uplands: Choose sites where access roads to the LTF can maintain a grade of ten percent or less.*

Terrain at all three sites presents difficulties in access road design. The LTF areas themselves are flat, but incoming road grades may exceed 10% for pitches up to 2000 feet in length. Due to surrounding steep terrain, logs will have to be brought into the LTFs by truck only. Loaders would not be able to carry logs perpendicular to the road center line.

*S5. Bark Dispersal: Choose sites where currents are likely to disperse sunken or floating wood debris.*

Slopes are quite steep off of both the Canal and Hoya sites. Although currents are generally slow in the area they are anticipated to be sufficient to disperse sunken and floating debris. Capsize Cove is somewhat protected from current; the SCUBA survey found subtidal accumulations of bark and other woody debris, suggesting that it had been used previously for log storage.

*S6. Site Productivity: Choose sites with the least productive intertidal and subtidal zones.*

None of the sites are considered highly productive. LTF development will probably have minimal impacts on biological productivity in or adjacent to the Project Area. Canal is situated on steeply plunging bedrock. Intertidal slopes are also steep at Hoya and Capsize Cove, although the subtidal zone at Capsize Cove is relatively flat.

*S7. Sensitive Habitat: Avoid sites on or adjacent to sensitive habitats: extensive tideflats, salt marshes, kelp or eelgrass beds, seaweed harvest areas or shellfish concentration areas.*

All three sites are located well away from the most sensitive Project Area habitats meeting this criteria (Canal and Hoya estuaries). Design measures will protect resident fish habitat adjacent to the Hoya site.

*S8. Safe Marine Access to Facilities: Choose sites that are safely accessible to tugboats with log rafts at most tides and on most winter days.*

Tide changes will not affect accessibility at any site. Winter weather (wind and high seas) may be a limiting factor at all three sites; Capsize Cove offers the best protection. Winter weather is likely to be a limiting factor for all logging operations in the Bradfield Canal.

*S9. Storage and Rafting: Choose sites where stored logs, log bundles, or log rafts will not ground at low tide. Minimum depths of 40 feet Mean Lower Low Water are preferred for log storage areas.*

All three sites provide log storage areas with sufficient water depth at Mean Lower Low Water.

*S10. Bald Eagle Nest Trees: Avoid sites within 330 feet of bald eagle nests.*

None of the sites are within 330 feet of bald eagle nests. Canal is about 1800 feet west of the nearest eagle nest. Capsize Cove is about 3000 feet east of the nearest eagle nest. Hoya is about 4900 feet west of the nearest eagle nest.

## D - LTF Site Selection, Design, and Marine Effects

### Construction and Operation Guidelines

*C1. LTF Design: Design LTFs to be least environmentally damaging as practicable, considering economics, facility requirements, physical site constraints, site usage (timber volume) and duration, water quality and habitat mitigation, other potential uses.*

Most environmental concerns are addressed through the siting guidelines described above for each site. Remaining concerns associated with erosion control, fish habitat protection, and visuals are addressed through design measures and operating guidelines described below.

Physical constraints due to steep topography, as well as visual objectives, present design challenges at all three sites. For example, Hoya and Capsize Cove may not accommodate any activities requiring more space than log truck unloading and turnaround. Each site will require separate, upland sites for sorting, storage, and equipment maintenance.

We anticipate a maximum potential wood volume of about 17 MMBF this sale. Depending on the alternative, a proportion of this volume will go directly from harvest units to barge by helicopter, bypassing the LTF entirely (see Table 3-26). A floating log slide with a minimal-height bulkhead made from native log materials is the most likely design at each site.

The design of Capsize Cove LTF would not accommodate anchorage or mooring of commercial or charter boats, and we anticipate that logging operations at this LTF would interfere with this use in the short term and periodically during future entries. An LTF at this site would not compromise the use of Capsize Cove as a safe anchorage during periods of inactivity over the long term.

*C2. Fill Structures: Design and construct fill structures to prevent erosion, pollution, and structural displacement.*

Existing beach topography will be incorporated into the design as feasible. Fill structures will be necessary to provide bulkheads and minimize access road grades coming into the LTF. These structures will be minimum height native log and/or stable rock revetments reinforced with riprap below storm tide level to protect fill from erosion.

*C3. Timing of Inwater Construction: If necessary, limit adverse impacts to marine resources and avoid conflicts with other users through construction and operation timing restrictions.*

Development of the Hoya LTF will avoid conflicts with commercial fishing and charter boats needing safe anchorage at Capsize Cove during LTF construction and during logging operations. No construction or operation timing restrictions specific to LTFs are proposed. We anticipate that herring attempting to spawn at LTF sites may be temporarily displaced by construction and logging operations. However, based on our observations of current spawning substrate, it is likely that herring would eventually spawn on LTF bulkheads and riprap.

*C4. Bark Accumulation Management: Use Best Management Practices to control intertidal and submarine accumulations of bark and other debris.*

The size limitations imposed by terrain at all three sites limits the amount of activity (sorting, trimming, etc.) that can take place at the LTF, thereby limiting the amount of bark and debris accumulation at the shoreline. LTF design will ensure low entry speed of log bundles into the water.

Some bark and debris will inevitably accumulate in the water during entry and rafting operations. The use of log booms will contain most of the floating and near-submerged debris that may be of concern to boat navigators in the area. The contract administrator will ensure that the operator is aware of this concern. The contract will include provisions to ensure that the operator immediately removes logging-related debris from the water. The monitoring plan (below and in Appendix C) also addresses this concern.

## D - LTF Site Selection, Design, and Marine Effects

*C5. Solid Waste Management: Remove solid wastes, including wood, generated from the LTF and dispose of it at an approved upland solid waste disposal site.*

The contract will include provisions to ensure proper disposal of solid waste in accordance with NPDES and other permits. Disposal methods may vary with type of waste accumulated. Daily cleanup of the LTF is required when accumulations of bark and other wood debris area present.

*C6. Bark Accumulation: Comply with permitting agency cleanup requirements (if any) if intertidal and submarine bark accumulations exceed standards (100% coverage exceeding one acre or an accumulation exceeding ten centimeters at any point).*

To date, cleanup has not been required at existing LTF sites known to exceed these standards. There is still some question as to whether cleanup is feasible or even beneficial. Cleanup efforts will require cooperative efforts between the Forest Service and permitting agencies. If cleanup or remediation plans are developed, they would address alternative transfer devices and methods, operational practices, and removal of bark from the ocean bottom. Remediation plans would be approved by ADEC and permitting agencies.

*C7. Bundle Speed: Control log bundle entry into receiving waters to the slowest speed practicable.*

LTF design limits log bundle entry speed to 3 feet per second by constructing a ramp of 10-12% grade that is used according to specific tidal ranges specified in the contract.

*C8. Surface Drainage Management: Use Best Management Practices to control surface water runoff from LTFs.*

Sort yards have been located well away from LTFs to minimize bare ground adjacent to marine waters. Grade control, sediment detention ponds, cross-drains and site cleanup requirements will address erosion and sediment transport associated with surface water runoff. All three LTFs and their access roads are in close proximity to small streams which will require protection. Only the Hoya site is in close proximity to fish habitat. The Capsize Cove site presents special difficulties due to the proximity of the access road to a small stream with minimal opportunity for providing road drainage with sufficient undisturbed filter between the road and the stream. This access road will require special design for sediment detention to minimize sediment transport into marine waters.

*C9. Control of Hydrocarbons: Utilize oil pollution prevention plans (BMP 12.8) and oil pollution contingency plans (BMP 12.9) to minimize petroleum products entering waters.*

Petroleum product storage and equipment servicing and refueling will be controlled through specific contract provisions. Spill Prevention Control and Countermeasure plans provide organizational structure and procedures for responding to oil spills.

*C10. Onshore Log Storage: Where feasible, give preference to onshore storage and barging of logs.*

Commercial and charter fishermen have expressed the concern that log rafting will interfere with their operations in the Bradfield Canal. This issue is addressed under marine resources and recreation discussions in Chapter 3 of this EIS.

Onshore storage to facilitate a barge-only operation would require many acres of sort yard space for log storage in both VCUs. LTF design to accommodate barging would require increased excavation and fill at saltwater, thereby increasing beach fringe disturbance and visual impacts. We anticipate that the amount of timber produced by this sale will not support the costs of a barge-only operation. For these reasons, it appears that a mixture of floating LTF development and helicopter-to-barge operations (as described in each alternative) is preferable from both an environmental and economic standpoint for this timber sale.

*C11. Facility Maintenance and Reclamation: Maintain active and intermittent LTFs and restore abandoned LTFs.*

LTFs in both VCUs will be treated similarly to the Frosty Bay LTF. These LTFs are considered intermittent and will be seeded upon completion of logging operations. Motorized access will be restricted within the Project Area; ramps and docks will not be provided in order to be consistent with road management objectives after the sale.



### Monitoring and Reporting Guidelines

*M1-6. Monitoring Requirements: Monitor for bark accumulations, oil sheen, surface runoff associated with LTF construction, operation and maintenance. Assure that corrective actions occur if necessary.*

The LTF permits will specify monitoring requirements and methods. Typically, bark accumulation is monitored annually at the beginning of each operating season according to specific protocols by SCUBA surveys at active LTFs. Waters in the vicinity of the LTF are monitored daily for the presence of visible oil sheens during LTF operation.

*M7. Report results of monitoring annually.*

A summary of LTF monitoring results is available and reports are submitted annually to EPA and ADEC. LTF permits establish reporting procedures.







# **Appendix E**

## **Reasons for Scheduling the Environmental Analysis of the Canal Hoya Timber Harvest**



# Appendix E

## Reasons for Scheduling the Environmental Analysis of the Canal Hoya Timber Harvest

### I. INTRODUCTION

The following analysis was prepared by the Stikine Area as part of the environmental document to address whether or not the purpose and need of harvesting 10-17 MMBF of timber from the Canal Hoya Project Area is a valid and reasonable objective. To arrive at this volume, it was necessary to answer four different questions. First, how much timber should the Tongass National Forest provide? Second, in the Tongass-wide timber sale program, how much should be produced from the Stikine Area? How should individual timber sale projects be scheduled to achieve the Stikine Area timber sale program objectives? Finally, how does the Canal Hoya Project Area fit into that schedule?

### II. HOW MUCH TIMBER SHOULD BE PRODUCED ON THE TONGASS NATIONAL FOREST?

There are two sources, the Tongass Land and Resource Management Plan (USDA 1997; referred to here as the Forest Plan) and the Tongass Timber Reform Act (TTRA), that help identify a Tongass-wide timber sale program level. The values used to arrive at the demand for timber are based on the information from the Forest Plan, Appendix M.

#### Forest Plan

The main goal for the Forest Plan is to sustain the diversity, function, and productivity of ecosystems. The desired conditions include natural environments which will provide the essential old-growth forests to sustain viable fish and wildlife populations for continued commercial, sport, and subsistence use and provide outstanding scenery for Forest visitors. The desired condition includes the availability of sawtimber and other wood products on a sustained-yield basis economically efficient to seek to meet the local timber industry demand.

The Allowable Sale Quantity is the maximum quantity of timber that can be harvested on an entire Forest in a decade (36 CFR 219.3). The Forest Plan estimates the average annual Allowable Sale Quantity at 267 MMBF (65 MMCF) of sawtimber and utility volume (Forest Plan, Appendix L).



# **E -Reasons for Scheduling the EA for the Canal Hoya Timber Harvest**

## **Tongass Timber Reform Act (1990)**

The Tongass Timber Reform Act (TTRA) was enacted modifying management of the Tongass National Forest. The Act was incorporated during the revision of the Forest Plan. TTRA requires the Forest Service to "the extent consistent with providing for multiple use and sustained yield of all renewable forest resources, seek to provide a supply of timber from the Tongass National Forest which (1) meets the annual market demand for timber from such forest and (2) meets the market demand from such forest for each planning cycle." The courts have held that this provision of TTRA does not present an absolute requirement for the Forest Service to offer a particular volume of timber for harvest. This requirement helps to identify a timber harvest program level that could be offered subject to the legal requirements of this and other sections of TTRA, several other laws, and the Forest Plan.

## **Estimation of Demand**

Demand can be estimated by looking at either installed mill capacity or actual historical consumption. Installed mill capacity provides a short term theoretical maximum estimate. Mill capacity is fixed unless facilities expand or new facilities are built. Because some mill capacity may not be presently used due to market demand for the finished product or other conditions, this is a theoretical maximum. Actual consumption is a limited estimate of demand based on historical market conditions. To the extent market conditions change from historical conditions, the actual demand may change. Despite these limitations, these methods provide the best available estimates.

Demand estimates using both installed mill capacity and actual demand are from the Forest Plan. Demand for sawtimber and utility wood based on installed capacity of timber processors in FY 1997 was 495 MMBF with the Wrangell Mill open (Forest Plan FEIS, Appendix M). The Wrangell sawmill is currently closed but included in the analysis to reflect potential reopening.

Average annual demand based on estimated consumption ranges from a current possible low of 65 MMBF to an estimated high of 206 MMBF in 2010 (Forest Plan FEIS, Appendix M). This estimate includes consumption by the Wrangell mill. This projection is based on the consideration of changes in the international wood products market, changes in the structure of the Alaska forest products industry, and continuing changes in the Pacific Northwest and Canada. This projection assumes that the lower grade material previously used for pulp can be exported.

## **III. HOW MUCH OF THE TONGASS WIDE TIMBER SALE VOLUME SHOULD BE PRODUCED ON THE STIKINE AREA?**

Historically, the Stikine's portion of Tongass National Forest timber sale program was 108 MMBF/Year (Tongass Land Management Plan, 1979). Approximately 40 MMBF was scheduled to meet a portion of the Chatham and Stikine Areas' contract commitment for the Alaska Pulp Corporation long-term timber sale (104 MMBF/Year), and 68 MMBF was available for the independent timber sale program.

The Allowable Sale Quantity is the maximum volume that can be harvested, not a future sale level projection and does not reflect all the influences such as market conditions or other resource constraints. The average annual ASQ assigned by the Forest Plan to the Stikine Area is 95 MMBF (23 MMCF). Of the 95 MMBF, 77 MMBF will be on lands that use standard logging system technology. The yearly quantity offered may be more or less than the average for the decade.

## **IV. HOW SHOULD INDIVIDUAL TIMBER SALE PROJECTS BE SCHEDULED TO ACHIEVE THE STIKINE AREA TIMBER SALE PROGRAM OBJECTIVES?**

The Stikine Area, along with the Ketchikan and Chatham Areas of the Tongass National Forest, plan timber sale preparation based on a ten year period. This schedule allows the necessary time to complete preliminary analysis, resource inventories, environmental documentation, layout, and appraisal, offer and award.

The Schedule is reviewed annually and lists both the NEPA analyses and sale offerings necessary to achieve a program level of 77 MMBF per year over a ten year period along with the dates for key milestones or "gates" in the sale preparation process. A project completes Gate 2 when environmental analysis is conducted and a decision is signed. Gate 3 represents

## E -Reasons for Scheduling the EA for the Canal Hoya Timber Harvest

sale layout, and Gate 5 is the advertisement of the timber sale. An environmental document may cover one or more sales in the ten-year sale plan. A copy of the current ten-year sale plan is in the planning record.

The Stikine Area is approximately 3.8 million acres subdivided into 139 Value Comparison Units (VCUs), which generally represent distinct watersheds. Within each VCU, specific management prescription areas are identified. Three management prescriptions designate suitable forest lands as available for timber harvest:

| Management Prescription | Goals  |
|-------------------------|--|
| Scenic Viewshed         | To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments as seen from the Visual Priority Travel and Use Areas, |
| Modified Landscape      | To provide a sustained yield of timber and a mix of resource activities while minimizing the visibility of developments in the foreground.                                     |
| Timber Production       | To maintain and promote industrial wood production from suitable timber lands, providing a continuous supply of wood to meet society's needs.                                  |

Of the areas that are planned for entry, a relatively small percentage of the total volume available for harvest is scheduled. This strategy for timber harvest scheduling spreads the harvest through time and space to reduce total environmental impacts. For example, the effects to water quality if 50% of a watershed is harvested at once are different than five entries that harvest 10% of the watershed every ten years. By allowing time for recovery and causing less ground disturbance, water quality is likely to be affected less, but both approaches would harvest the same amount of volume.

The current sale schedule represents one solution to meet program objectives; other solutions are feasible. The timber harvest program does respond to allocating harvest across available lands to balance the need to mitigate impacts and leaves some areas unscheduled to maintain future options.

### V. HOW DOES THE CANAL HOYA PROJECT FIT INTO THE SCHEDULE?

The Canal Hoya Project Area is located in Value Comparison Units 5200 and 5210. VCUs 5200 and 5210 have management prescriptions of Modified Landscape, Timber Production and Old-Growth Habitat.

The current ten year timber schedule was updated in October 1997 and provides for 75 MMBF of timber volume to be offered in fiscal year 1998. Part of this volume will be obtained from the Canal Hoya Project Area. The volume is scheduled to be sold in one sale offering.

### VI. CONCLUSION

Considering the timber harvest program objectives for the Tongass National Forest and the Stikine Area's contribution to those program objectives, the proposed harvest of 10-17 MMBF from the Canal Hoya Project Area is reasonable and valid. This volume will contribute to meeting the Stikine Area average annual volume of 77 MMBF. If any less volume is harvested in the Canal Hoya Project Area, we would probably seek to complete the analysis of another area before originally scheduled, or increase the volume of another ongoing analysis.





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